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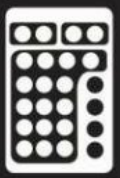

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Tuan
Nguyen

YOU'RE PART OF THE MAXIMUM PC CREW

I'VE BEEN AT *MAXIMUM PC* for a good month now, and I have to say, we have an amazing team. No other publication on Earth has a team with as much passion as we have for the PC platform. And it's not a coincidence that we're just as diverse as the PC ecosystem itself. I think this helps our readers, too.

There are a lot of changes—good ones—that are being considered and introduced to the publication. For example, our website is getting a revamp that will hugely improve its readability and ease of engagement. Our team wants to engage with you as much as possible. This is critical for the evolution of *Maximum PC*.

There are times when some readers may get upset with certain things we say or publish. But that's not actually a bad thing. Different points of view are always a good thing. And it's exactly this that makes the PC such a wonderful thing. I can't imagine a *Maximum PC* where all the editors and writers have the same points of view.

So, I'm welcoming you to stir the pot. Send us feedback and share your ideas. Maybe you feel you have something outrageous that readers would enjoy. Maybe you even want to write for the magazine. Who knows. Whatever it is, though, we want to hear it. And I'm making the best effort to read everyone's input. What would you do, if you were running the magazine?

I think overall, the team here agrees that we have lots of opportunities to inject new subjects into *Maximum PC*. I'd like to bring to the table topics of usage, tricks, and fresh ways of reusing existing hardware. Equally, covering the culture around the PC platform is important, too. How do certain hardware combinations affect gaming? What do the pro players in the eSports scene use for their rigs? Why do they use them?

There will, of course, always be the "maximum" side of the publication. This is to say we always want to show you what's pushing the envelope. The cutting-edge is not always the best technology, but it does lead the way for companies to refine and hone in on what's essential.

Now, about that "minimum." I'd like to make sure *Maximum PC* helps you avoid outright horrible products. We're going to do some investigation work. If we find things that make your PC experience worse, we're going to call them out. No BS.

Tuan Nguyen is Maximum PC*'s editor-in-chief, also known as "the pointy end of the stick." He's been writing, marketing, and raising hell in the tech industry for 19 years.*

↘ submit your questions to: comments@maximumpc.com

THE NEWS

Are Cool PC Form Factors Practical?

Good products will always succeed, with or without CES

Innovative? Maybe. Practical? Not really. Interesting? Yes.

THE CONSUMER ELECTRONICS SHOW (CES) is a tech fair that usually brings all sorts of craziness, and we're not talking about the Vegas crowd. All manner of gadgets and gizmos are demoed at the show, year after year, and frankly, most of them never actually make it to market. Companies like to show off a lot of concepts at CES to wow the audience and grab the limited share of press mindshare, but you can't blame them for trying—everyone's vying for attention.

The good thing about all of this is that it shows the effort being put into being innovative, regardless of whether or not there's a practical use. Thankfully, there's a lot of that happening in the PC industry and one of the areas that excites us is how the shape of the PC, the form factor, can be changed.

In the last few years, the most striking development was actually from Apple, in the form of the black, cylindrical Mac Pro. Everything was custom designed, including the innovative cooling system. Then there was Razer's Project Christine, which was announced at CES a year ago. Unfortunately, that didn't make it to market, but it was still exciting to see. Later in 2014, Alienware debuted its striking Area 51. Needless to say, we were equally excited to see CyberPower PC unveil its "Fang Trinity" PC this time around.

Developed by DeepCool, the Fang Trinity PC is an interesting form factor that separates components in a way that's similar to Razer's Project Christine, except it's a lot more practical. Where Project Christine failed, Fang Trinity succeeds. The chassis accepts off-the-shelf parts, which means that you can make upgrades as you see fit. It doesn't restrict you to proprietary modules, and still succeeds in allowing for a good amount of expansion. In fact, Fang Trinity supports significant storage expansion: space for three or more SSDs, two HDDs, and even an optical drive. Liquid cooling comes standard, and yes, it takes a full length, full-fledged graphics card.

> “In the last few years, the most striking development was actually from Apple.

But alas, nothing's ever perfect. Fang Trinity is heavy. CyberPower PC says that the final version will be aluminum-based, significantly reducing its weight. The shape, however, will likely be problematic for some users. The footprint is wider than a typical case, and it's certainly not as easy as toying around in a traditional chassis. Also, because the graphics card is in a separate compartment to the motherboard, a PCI Express extender is used that could impact signal and performance. There are obviously still a few things that have to be worked out on the Fang Trinity.

But this goes to show that companies are thinking of new ways to improve existing products. It may seem small, but changing the design of one element of a system can impact its function, and usability. Products like Alienware's new X51 and CyberPower PC's Fang Trinity PC take interesting approaches to problems such as thermal management.

As with anything in life, making changes often requires compromises in some form or another. We're excited to see companies willing to experiment—heck, even make mistakes. At the end of the day though, the users will vote with their wallets, and if a product is sincerely awesome, it won't need the hoo-ha of CES to be successful. **–TN**

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MECHANICAL KEYBOARDS ARRIVE ON THE GAMING LAPTOP

MSI proves laptop planks don't have to suck

Finally a laptop keyboard good for gaming.

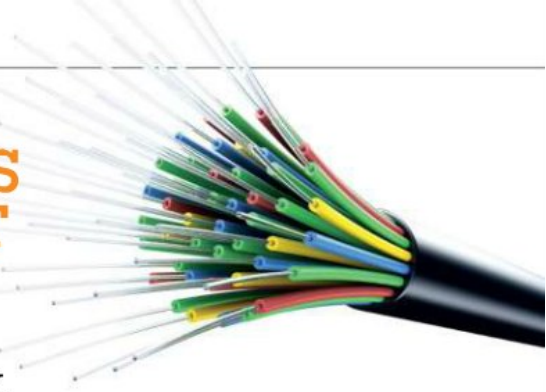
OVER THE COURSE of the last couple of years, MSI has been taking the gaming laptop category by storm, and we've seen a lot of interesting offerings from the company. However, it's MSI's new GT80 Titan SLI-009 that we find most intriguing. The company brought its latest system (along with several other goodies) to the Consumer Electronics Show in January, where we had the chance to check it out.

There's a lot going on with the GT80—obviously, the inclusion of dual GPUs is notable, though hardly a first in the gaming laptop category. However, what is a first is the GT80 Titan's built-in mechanical keyboard in favor of the usual membrane planks that are so commonplace.

SteelSeries is behind the design of the keyboard, which uses Cherry MX Brown switches that offer a light tactile response and are non-clicky (though not silent). You'll also notice the trackpad is positioned to the right of the keyboard, not below it, so that it more closely resembles a desktop setup. In addition, if you tap the top-left corner of the trackpad, it turns into a digital number pad with haptic feedback—pretty snazzy!

The space above the keyboard pops off to offer easy access to things like RAM and storage. That's a huge convenience compared to some systems that require almost a complete teardown to access internal parts.

Also spotted at MSI's CES booth were interesting items from a variety of product categories, including motherboards. MSI showed off a new model featuring a USB 3.1 Type-C connector. Compared to USB 3.0, MSI demonstrated significantly faster transfer times via USB 3.0. **–PL**



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A FEW MONTHS BACK, South Korean ISP SK Broadband revealed its upcoming 10Gb/s Internet service, while the rest of the world, including the United States, looked on with envy. Well, not so fast. Minnesota-based US Internet has just beaten the Koreans to the punch by announcing the rollout of a 10Gb/s fiber broadband service in Minneapolis. Available now for $399 per month, the company's (and the world's) fastest Internet plan comes with the promise of matching upload and download speeds that are tens of times faster than your average US broadband connection. It will be interesting to see how long US Internet remains the only provider of 10Gb/s Internet, with a few other companies, including Verizon and Google, also having high-speed offerings on their agenda. **–PC**

ACER REVEALS GAMING MONITORS BOASTING 'WORLD FIRSTS'

G-Sync enabled IPS; edge-to-edge frameless

ACER HAS OFFICIALLY ANNOUNCED its 27-inch XB270HU gaming monitor. Specs-wise, it's a step up from its expected offering. Rather than another TN panel display with G-Sync, the monitor is the world's first G-Sync enabled gaming monitor with an IPS display. Along with the XB270HU, Acer also announced another 27-incher with a unique design. The XG270HU, which has a fast 1ms response time, is unique for its edge-to-edge frameless display—a world first, according to the company. Built with recycled ABS plastic, it features HDMI 2.0, DVI, and DisplayPort 1.2. Both models will be available in March 2015, but prices are yet to be announced. **–PC**

Tech Tragedies and Triumphs

A monthly snapshot of what's up and down in tech

TRIUMPHS	TRAGEDIES
OFFICE FOR ANDROID Microsoft released a preview of its Office suite for Android users, in case they need more ribbon interfaces.	**FAKE HTTPS CERTIFICATES** In-flight ISP Gogo pretended to encrypt personal info and then swore it wasn't being naughty.
DISH'S SLING TV Twenty bucks a month will get you a box that streams ESPN, Cartoon Network, CNN, and more. Sadly, no word on a Kung-Fu Channel.	**COMCAST RENTAL FEES** The Internet provider hiked its modem rental price by 20 percent. Luckily, buying your own DOCSIS 3.0 modem isn't illegal (yet).
A SQUARE TO SPARE Virgin Train social media team comes to the rescue when a rider tweets about being stuck in a restroom without toilet paper.	**FREE IS EXPENSIVE** ComScore reported that 68 percent of shoppers in Q3 2014 used free shipping, but Reuters says many big stores are selling at a loss.

Tom Halfhill

FAST FORWARD

Soft Machines Claims Major Breakthrough

SOME FOLKS ARE WONDERING why I haven't written about Soft Machines, a startup that claims to have solved the problem of scaling software performance to match the potential of multicore processors. Well, the secretive firm has emerged from stealth mode.

I've hesitated to write about Soft Machines because not enough information has been disclosed to reach a fair conclusion. Although the Silicon Valley startup has produced a test chip and is showing benchmarks that appear to validate its extraordinary claims, important details remain under wraps. So, for now, I'm an open-minded skeptic. I've been down too many similar roads before.

Consider the problems Soft Machines claims to have overcome. Historically, most software is single threaded, which means the processor executes the program as one continuous instruction stream. That was fine when processors had only one CPU core. As processors grew faster and more powerful, programs ran faster, too. This happy relationship lasted for decades until power consumption soared beyond the practical limits of system cooling.

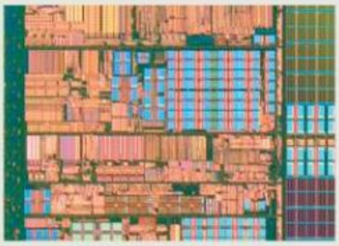
That's when engineers began designing multicore chips. Distributing the software workload across multiple cores enables a processor to execute multiple instruction streams simultaneously. But a processor can't automatically divide a single-thread program into multiple threads, and writing multithreaded software can be a pain in the butt.

> "The claim that there's no need to rewrite single-thread code is a big deal. It's the Holy Grail. But is it real? It's a problem the world's best brains have wrestled with for at least 50 years.

Soft Machines claims it can divide a single thread into virtual threads or "threadlets" that run in parallel, without requiring programmers to rewrite their code. The firm claims it can perform this trick by rapidly translating the binary code into the processor's own native code. Hence the technology's name: VISC (variable instruction-set computing), a wordplay on CISC (complex instruction-set computing) and RISC (reduced instruction-set computing).

The first claim—dividing a thread into threadlets—is the most credible. It's like the superscalar execution that processors have been doing since the '80s, except Soft Machines says it spreads the threads across multiple cores. It sounds too complex to be worth the modest gain, but the firm says its chip executes 2.1 instructions per clock cycle on the SPEC2006 tests. That's more than twice the efficiency of an ideal scalar processor.

The second claim, that there's no need to rewrite single-thread code, is an even bigger deal. It's the Holy Grail. But is it real? Parallel processing is a problem the world's best brains have wrestled with for at least 50 years. Also, by doing this trick on binary code at runtime, Soft Machines loses the insight of analyzing the programmer's source code. Too good to be true?



Soft Machines need to get into silicon to prove its claims.

Ditto for the startup's claim it can rapidly translate any CPU architecture's binary code into VISC native code. The company says it has created translators for the ARM and Intel x86 architectures that suffer less than a 5 percent performance penalty. Normally, 50 percent would be impressive. Even if Soft Machines' other claims prove bogus, it could build a business on the emulation technology alone—if it's really that good.

I've heard similar claims before, most notably 15 years ago from Transmeta, another promising startup. Although Transmeta's emulation technology was good, its processors weren't quite up to beating Intel's. Wisely, Soft Machines isn't making its own processors. It will license the technology to other companies that will take the risk. Perhaps in a year or two, we'll find out if VISC is a breakthrough or a smashup.

Tom Halfhill was formerly a senior editor for *Byte* magazine and is now an analyst for *Microprocessor Report*.

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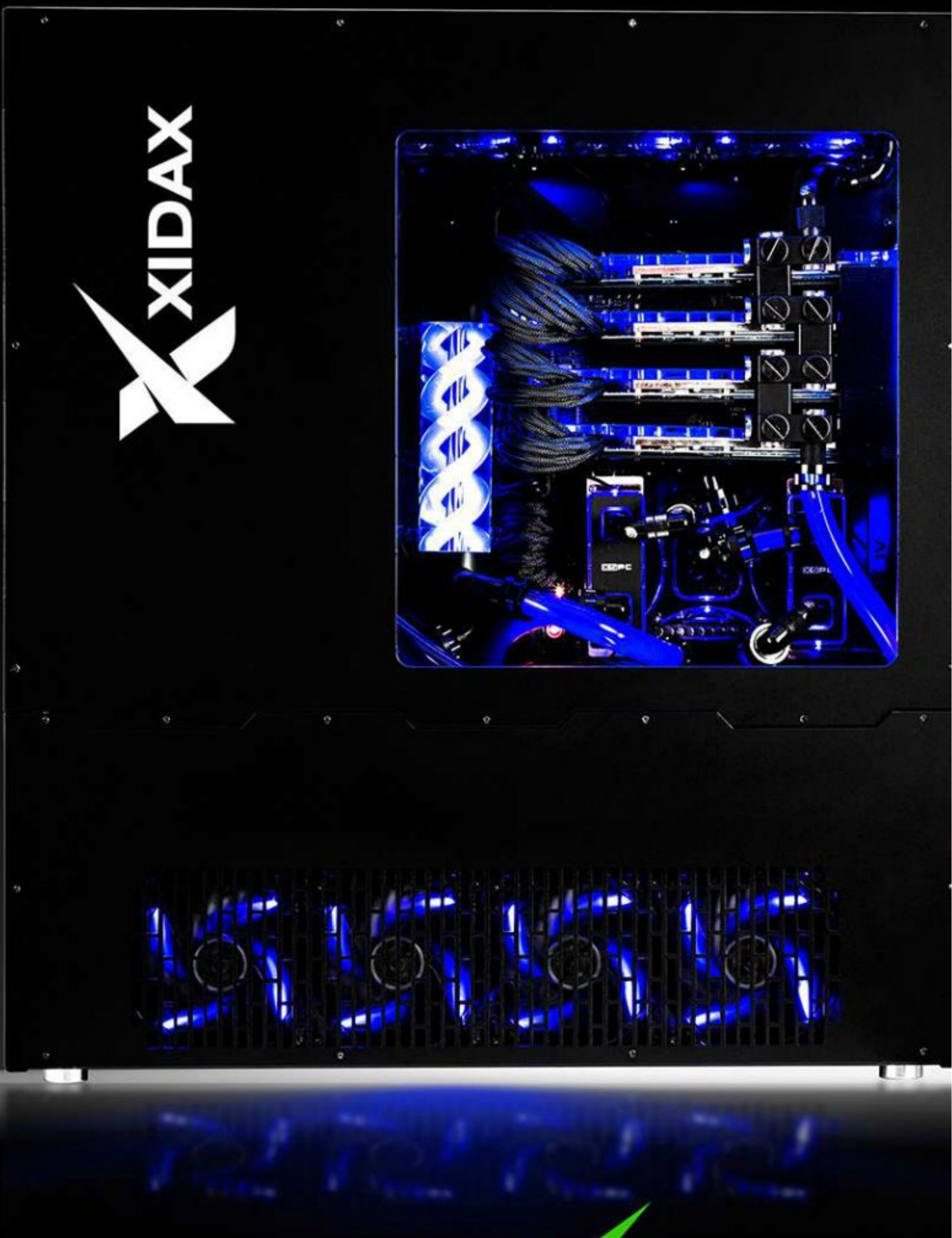

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Thomas L. McDonald

GAME THEORY

PC Gaming's New World

IT'S NOT EASY PINNING HUGE CHANGES to a single year and saying, "This is when 'X' happened." Time and tide don't work that way. Changes that seem to happen all at once and define an era usually build for years. It's only when we step back to look at the view that we notice everything is different, and that those differences are important.

In all the years I've been covering computer gaming, 2014 saw the final flowering of the biggest changes that actually mattered. Even when PC gaming emerged into the mainstream in the 1990s, it was just expansion and growth, not change. Developers spent years chasing the phantom of realistic graphics, and when they finally caught it, designers reacted with a retreat to the elegant simplicity of the very 8- and 16-bit aesthetics we had been so eager to leave behind. When we finally reach photo-realistic 3D engines, no one will want them. We'll just plunge into the uncanny valley.

The things that don't matter sucked a lot of oxygen out of the room. *Assassin's Creed Unity* doesn't matter, except to show that the bigs have become so musclebound and so relentless in their attempts at monetization that they can ruin otherwise excellent work. Oculus Rift doesn't matter because it's unlikely to move beyond a devoted but relatively minor market. "GamerGate" doesn't matter because the pet obsessions and grievances of people who make games are of no interest whatsoever to anyone but people who make games.

The two things that really mattered were early access and the flourishing of indie gaming. Early access matters because it changes the relationship between developer and gamer, and between gamer and game. *Minecraft* altered the idea of unfinished product: it was already making money in alpha. It was a phenomena in beta. By the time it got to 1.0, who noticed?

This constant evolution of gaming content and design may be good or bad (I don't love it), but it fundamentally alters the way we access and respond to content. It also obliterates the notion of release date. This strange subcurrent in PC gaming culture always pitted fan against publisher. With early access, it's been changed into a kind of collaborative process that sometimes yields a finished game, sometimes not.

Indie gaming matters because it doesn't matter any more: that is, big or little, a game can now find an audience. Ludum Dare and other rapid development challenges are pushing quick games out there that expand the number and diversity of voices we're hearing.

A game can now be as personal a statement as a blog post, and take as long to experience while still offering rewards to both the user and the designer. Thus, games join prose, poetry, painting, and music as a legitimate form of self-expression, and one not necessarily requiring a team or even a budget.

Thomas L. McDonald has been covering computer gaming for over 25 years.

> 'GamerGate' doesn't matter because the pet obsessions and grievances of people who make games are of no interest whatsoever to anyone but people who make games.

Minecraft has shown that early access trumps incredible, realistic graphics.

THE LIST

8 AWESOME KICKSTARTER GAMES

8 WASTELAND 2

The sequel to the original game from 1988 that inspired the *Fallout* series.

7 SHOVEL KNIGHT

A challenging, retro 2D side-scroller with a surprisingly charming story.

6 SHADOWRUN RETURNS

A sci-fi/turn-based RPG set in a cyberpunk dystopian world. Need we say more?

5 FTL: FASTER THAN LIGHT

Navigate your own spaceship through a dangerous galaxy in this strategy game.

4 ELITE: DANGEROUS

Frontier Developments recreated our very own galaxy, star for star. This is the closest you'll get to flying through the Milky Way.

3 DON'T STARVE

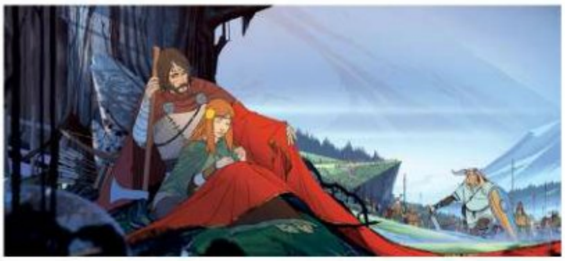
Your goal in this game is to simply stay alive. Spoiler alert: You will fail at this. Many times.

2 DIVINITY: ORIGINAL SIN

If you enjoyed the *Baldur's Gate* games in the '90s, you'll enjoy this challenging and intricate RPG.

1 THE BANNER SAGA

A Viking-themed tactical RPG with the gorgeous art style of Disney's *Sleeping Beauty*.



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TALKING

This is Dangerous

From recreating the universe to rendering at up to 16K resolutions, the father of *Elite: Dangerous* reveals all in the *Maximum PC* podcast

How do you go about modeling a universe that not even the Hubble telescope can accurately see? What's it like being a key developer for the Oculus Rift, and what hurdles does the technology need to overcome? What advantages does Kickstarter funding have? How do you manage over-zealous PvPers in games? We talk to the genius behind one of the most important PC games ever, David Braben, to discover all the answers.

Head to www.maximumpc.com for the full David Braben chat.

Maximum PC:
For people living under a rock, can you tell us about the game?

David Braben:
Elite: Dangerous is the fourth in the series of *Elite* games and it's very exciting. You start off with a small amount of credits and a small spaceship and you can do what you like in a 1:1 model of our galaxy filled with pirates, assassins, and all sorts of things. Just have a great time with your friends. It's a massive multiplayer online game.

MPC:
One thing you didn't mention there is that it supports Oculus Rift and VR headsets...

DB:
Right from the start we did plan to support head-mounted displays, but we didn't think we were going to add them until much later. We were supported by Kickstarter, and we went live with our first alpha on December 15, 2013. The reception was absolutely fantastic. Really, really positive.

But one of the things people were saying was, "Wouldn't this game be great on Oculus Rift?" DK1 had already come out at that point. And people on our team already had them at home and were very excited about DK1. And similarly the backers were saying, "Oh, we really want support for it." And the great thing about being an independent studio publishing ourselves, we were able to think, actually yes, that would be really good; we are the audience here, we should be able to decide what we do.

And so on December 20, only five days later, as a Christmas present to the backers, we released the game supporting Oculus Rift, 3D TV, and a few other things. The point is it felt so good and it felt so right adding that support. Interestingly, had we been with a publisher, it's that sort of thing that would have taken a lot, lot longer because we would have had to have made a business case for it, we would have had to plan it, and it would end up being done after the end of development.

MPC:
Having played the game using Oculus Rift, it looks amazing and it actually feels like you're in a cockpit. The in-game flightstick looks a lot like something from MadCatz; the X52 flightsticks.

DB:
Yes, that's right. We started off playing on an Xbox controller, but actually once we'd tried it on a flightstick, it felt so good, it felt so solid. Your point about feeling like you're truly in a cockpit, one of the advantages there is that, because you're sitting, it feels so natural. The sticks make it feel that much more solid so we decided to go with them. It feels like you're flying a spacecraft.

MPC:
You're modeling the universe on a 1:1 scale with our own?

DB:
Every single star in the night sky that you can see is in the game. Even the really faint ones. We can see between 6,000 to 7,000 in the night sky, and they're all in the

Whether you want to fight, trade, or mine, *Elite: Dangerous* offers a playground of 400 billion stars.

game, but so are the full 160,000 that we've got from star catalogs and other sources.

The bulk of the stars are M-class red dwarves—not one is visible to the naked eye, surprisingly. The nearest star, Proxima Centauri, is one of these, which you can see with good binoculars. Even Hubble can't see those beyond about 50 light years, but what it can see is them appearing as smoke. You can't resolve individual stars. So what we've done is used algorithms to populate those. That's how we got the other 400 billion stars. Those are all in what we believe to be the right position. We know where the densities are and we think it's a very accurate representation of our galaxy.

MPC:

So there are no artificial borders then, you can just fly off?

DB:

You can, you can just fly off. Time is your only artificial barrier... you can just keep going. It's really big. In round figures it's about 100,000 light years across. It's a stupid distance.

MPC:

Can you get so far away that it's hard to get back?

DB:

It is possible to get stranded, but you can scoop fuel off the stars, so it's certainly possible to go a huge distance. People have been doing this in groups already.

MPC:

Is the goal of the game to shoot and kill, or harvest, or...

DB:

It's up to you. You don't choose a class or anything, and you don't decide to be an elf or whatever, but you can do things opportunistically. A beginner may well spend their time mining and trading because that's much safer, but there's still a lot of combat—it's a lot like World War 2 planes fighting. If you go in with your friends it's often safer, because you can help each other.

The majority of the ships are AI, but you can meet other players. But we try to discourage player versus player; although it does still happen a lot. All players are members of a group called the Pilot's Federation. And the Pilot's Federation puts a bounty on the head of anyone who kills its own members. But, that gives you the opportunity to become a notorious pirate, and some people have already been bragging about how big a bounty they've managed to get. But of course we have in-game news feeds, so people can see if there's a big bounty nearby and they all go piling in after you. It's quite hard to sustain a really big bounty for a long period of time.

MPC:

You started on Kickstarter. How much money did you raise?

DB:

Just over $2 million on Kickstarter, but we also raised through our own site at the same time, so it was significantly more than that.

MPC:

The game not only supports rendering in 4K, but goes all the way up to 16K! Is that just to future-proof the game?

DB:

Yes. People have said we're stupid, but when we started the Kickstarter back in 2012 and said we were going to support 4K, people said, "That's ridiculously expensive, why would we want to do that," but it's all about future-proofing. Look now, a 4K monitor is below $1,000 and they're coming down quickly. Now 8K TVs are available—only a small number of them, and they're very expensive; but the great thing with technology is the speed at which prices come down. One of the reasons we supported 16K is for shows, so we can do really big shots for posters. In the past an artist would have drawn them, but now we can use a screenshot, and that's brilliant.

MPC:

What do you think about the future of Virtual Reality?

DB:

I think technology is marching at such a rate, and it's getting better. If you compare the Oculus DK1, which we first supported, to the DK2, that is available now, [the game] is so much better on the DK2. The headtracking they've added has made a big difference; the resolution improvement from 720p to 1080p has made a big difference.

There are always challenges, it's a difficult technology for them to deliver. But it's getting better. I think there is still room for higher resolution. The frame rate has gone from 60Hz on the DK1 to 75Hz on the DK2, and that also makes a difference. I think that progression is really healthy.

DOCTOR

THIS MONTH THE DOCTOR TACKLES...

> SATAe vs. M.2
> Boot Problems
> XL Cases

Life in the Fast Lanes

I'm a gamer looking to upgrade soon. I'm running an Intel Core i5-2500K overclocked to 4GHz with a Corsair H55 liquid cooler on an Asus P8Z68-V Pro mobo, with 32GB RAM, 1TB HDD, and a 120GB SSD, with two Nvidia GTX 760s in SLI overclocked to 1,300MHz. I'm looking to upgrade my mobo and CPU because LGA1155 is outdated. I really want to find a mobo that'll give me the most for those graphics cards because right now mine is PCIe 2.0 x8/x8. Is there a mobo that can run PCIe 3.0 x16/x16? I've a $400 budget, so should I get one now or wait 'til SATA Express comes out?

—Tim Toavs

THE DOCTOR RESPONDS: You can upgrade for $400, but you won't be getting dual x16 SLI action, at least not on the Intel platform. That type of bandwidth is reserved for the "big boy sockets" like X79 and X99 chipsets, and they need Intel's Core i7 CPUs. To get the full 40 lanes of PCIe the X99 chipset offers, you'll need to move up to the Core i7-5930K, which is $600. You'll have to stick with the consumer-grade chipset, which is Intel's new Z97.

You can get a mobo from all the usual suspects for $150, and then grab a Core i5-4690K "Devil's Canyon" CPU for $210 and you'll be set for at least a few years, as these motherboards (LGA 1150) are compatible with Intel's upcoming Broadwell CPUs, too. This chipset (and CPUs) only offer 16 lanes of PCIe, so you can run one card at x16 or two at x8. It shouldn't impact performance much, as most modern videocards aren't handicapped by x8 bandwidth.

As for SATA Express, our guess is M.2 will become the favored interface—it's simple and offers the same performance as SATAe. Even better, you can buy an M.2 SSD now, though selection is very limited. Our tip is don't wait for SATAe. Get a board with an M.2 slot and you'll be set.

One GPU or Two?

My system is about two years old. I've an EVGA GTX 670 superclocked 4GB videocard. It runs great and plays all the latest games with no issues. I'd like to buy another GTX 670 and run them in SLI. Currently I can buy a slightly used one for about $150 or new for $300. My system is an Intel Core i7-3770K, 32GB of Patriot memory, an Asus P8Z77-V LE mobo, and a Samsung 256GB 840 Pro SSD running Windows 8.1. Should I buy the second GTX 670, or look into a GTX 980 instead? I'd like to keep this system at least two more years and want my videocard to run current games until then.

—Jim Catan

THE DOCTOR RESPONDS: This is a tough call, Jim, but we'd probably stick with a second GTX 670 SLI as it will be very close to a GTX 980 in performance, and cost you a fraction of the price. Plus, since you have the 4GB version, you're all set for 4K gaming. Of course, SLI has always been a bit more problematic to run than a single card, though both AMD and Nvidia have done a generally excellent job of providing driver profiles for AAA games the day of launch, so those concerns have gotten easier to deal with. Perhaps the biggest question is whether you can handle double the heat and noise in your case, and whether your power supply is capable of running SLI? These are all issues that SLI-runners must deal with, which is why many people just want to run a single GPU, as there are zero hassles taking that route. If you decide a single card is your future, but you're on a budget, consider the Maxwell-based GTX 970 as it's an absolute bargain at $330. It will offer probably about the same performance as your dual cards, with less than half the noise and heat.

A single GPU like the GTX 980 is usually capable of performance equal to older cards in SLI.

Optical Delays

I upgraded my Asus Z77 WS gaming computer to a Z87 WS MOB and Devil's Canyon CPU. After the upgrade I was getting long boot times with a Samsung 850 SSD boot drive. All drivers, BIOS, and Windows 7 were up to date. I systematically removed the USB devices to see if they

↘ submit your questions to: doctor@maximumpc.com were causing the problem, but it persisted. I also checked Microsoft and they had a software update but that didn't help. I had two DVD/CD internal drives installed and when I went to load up a DVD it didn't work. I removed the drive and bingo, boot time dropped to 15 to 20 seconds. Could the BIOS searching for this drive be the cause? Side note: the Asus Z87 WS makes for a great gaming board, with two 12v 8-pin CPU sockets and one 6-pin socket on the mobo to provide extra power for overclocks and multiple graphics cards. Has *MPC* ever used a workstation board for a gaming computer?

—Ron Apra

THE DOCTOR RESPONDS: It sounds like you practiced excellent troubleshooting, Ron. As we've learned over the years, trying to "fix" issues when the hardware is faulty is an exercise in frustration. As far as your situation goes, yes, the POST process can hang when it finds faulty hardware. Though we've seen it in the past with optical drives, we've mostly experienced it with hard drives, and lately, SSDs. The system will poll each device on boot, and will wait for a response before either showing an error or moving on. In general, whenever your system is hanging during the boot process, it's hardware-related. As an aside, we'd test to make sure the drive is really dead before tossing it. Either swap the SATA port it's using or try a different cable.

Regarding your side note, yes we have used workstation boards for gaming, and you're right, they're excellent. In fact, if you're inclined to run multiple GPUs they're the best, as they provide more bandwidth than consumer-based motherboards. However, you'll need to run at least three cards before you start seeing a difference. The rest of the differences, such as support for higher core count GPUs and RAM, are just for bragging rights though, and won't make a difference in games.

Towers can take a ton of hardware, as Dream Machine 2013 showed.

Massive Tower Needed

I'm running an old Intel Core i7-920 Nehalem CPU in a Lian Li V1110 case with nine hard drives, two Blu-ray drives and an SSD as a media server, movie-ripping station, and occasional gaming box. I've been waiting for the Haswell-E to drop, but having read *Maximum PC*'s reviews I'm quite worried about CPU heat. In my current rig, I'm using a Thermalright Ultra 120 cooler, and my rig will occasionally reboot due to the heat. I love that my Lian Li case can accommodate many HDDs and is soundproofed, but it won't accommodate a large water cooler such as the Corsair H100 or H110. If I want to keep my case, but upgrade the motherboard, CPU, and RAM, what is the best cooling solution? Alternatively, is there a roomy case that can accommodate lots of drives, is quiet, and has room to fit a large water cooler? **—Charles**

THE DOCTOR RESPONDS: Good news, Charles, there are several cases that meet your demands for hardcore storage and cooling. We know the Cooler Master Cosmos II and the Corsair 900D will both hold all that storage and a fat radiator, or at least a closed-loop liquid cooler like the NZXT Kraken X61 or the Corsair H100i. We've had both in the lab and can attest to their ability to swallow hardware, though for our money the Corsair 900D gets the nod. The 900D can hold nine hard drives, two power supplies, and a 360mm radiator, so throwing in a Corsair H100i would be like seeing if we could eat a single hot pocket. As far as quiet goes, you have to be able to strike a balance between good airflow and usable temperatures. Insulated cases are great for noise but not the best for keeping temperatures down. For what it's worth, when we built the Dream Machine in 2013 using the Corsair 900D we had over 17 case fans of the Scythe Gentle Typhoon variety and it only emitted a gentle hum even under load. It was entirely water-cooled though. In our experience, the GPUs are the noisiest components in a PC, so if you can keep those quiet and use good case fans you'll be well on your way.

Out of Retirement

I've a home-brew PC that's been sitting unused for about 12 to 18 months. It was working fine when last used but upon starting it up in runs in super slo-mo. I reseated the RAM and videocard and ended up swapping out the VelociRaptor primary hard drive for an extra SSD I had, but it didn't help. I then tried reinstalling Windows, which took days. Installation of the videocard driver also took days and the motherboard driver setup would not even run as it kept timing out. Any ideas?

—Rob

THE DOCTOR RESPONDS: It's best to go component by component. First just see if it will POST quickly with a single stick of RAM and nothing else, aside from the CPU. Then add the GPU, then a hard drive, etc. And for each component, see if you can test it in another PC. If you can't isolate an individual piece of hardware it's very likely the motherboard itself. Our advice is to buy a new one from a place with a generous return policy, and try it out. ⏻

[SECOND OPINION]

REGISTERING MS OFFICE

I read in your Holiday 2014 issue about the problem a reader had with MS Office registering. I work at a community college as an IT guy and we ran into the same problem. And it was only with the 64-bit version of Office 2010. It would initially register, but after doing updates it wasn't activated. Even putting in the same key again failed. One of my coworkers found the solution, so here it is: Run a Command Prompt as administrator (right-click, choose "run" as administrator). Then navigate to the Office14 folder. For a 64-bit version it would be: C:\Program Files\Microsoft Office\Office14. Once there run the following command, "cscript ospp.vbs /act." When you run Office again it will be registered.

–Greg Furtman

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- 16GB Dual Channel DDR3-1600MHz Memory
- 256GB Samsung XP941 M.2 PCIe SSD
- 1TB 7200RPM SATA II Hard Drive
- 2 Hard Drives + 2 M.2 SATA SSD Drives or 2 M.2 PCIe SSD Drives capable
- Hardware Raid 0,1 Function capable with SATA Interface
- Full sized Keyboard with color LED backlight
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- 6GB DDR5 NVIDIA® GeForce™ GTX 970M GPU
- Optional NVIDIA® GeForce™ GTX 980M GPU
- 8GB Dual Channel DDR3-1600MHz Memory
- 1TB 7200RPM SATA II Hard Drive
- 2 Hard Drives + 2 M.2 SATA SSD Drives or 2 M.2 PCIe SSD Drives capable
- Hardware Raid 0,1 Function capable with SATA Interface
- Full sized Keyboard with color LED backlight
- Intel® Dual Band Wireless-AC 7265 Wireless LAN + Bluetooth Wireless Combo
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- 120GB Crucial M500 mSATA III SSD
- 1TB 7200RPM SATA II Hard Drive
- 6X Blu-ray Reader / 8X DVD±R/2.4X +DL Super Multi Drive
- 2 Hard Drives + 2 mSATA SSD Drives Capable with Raid 0, 1 Function
- Full sized Keyboard with color LED backlight
- Intel® Dual Band Wireless-AC 7260 Wireless LAN + Bluetooth Wireless Combo
- Built-in Card Reader, Fingerprint Reader and 2.0M FHD Video Camera
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- 3GB DDR5 NVIDIA® GeForce™ GTX 970M GPU with Optimus™ Technology
- 8GB Dual Channel DDR3-1600MHz Memory
- 1TB 7200RPM SATA II Hard Drive
- 2 Hard Drives + 2 M.2 SATA SSD Drives Capable with Raid 0,1 Function
- Full sized Keyboard with white LED backlight
- Intel® Dual Band Wireless-AC 7265 Wireless LAN + Bluetooth Wireless Combo
- Built-in 2.0M FHD Camera & Fingerprint Reader
- Sound Blaster® X-Fi™ MB3 Sound System
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- Microsoft® Office 365 Trial*

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NP 8670

- 4th Generation Intel® Core™ i7-4720HQ Processor (6MB L3 Cache, 2.60GHz)
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- 2GB DDR5 NVIDIA® GeForce™ GTX 965M GPU with Optimus™ Technology
- Also available in GeForce™ GTX 970M GPU with model NP8671 and GeForce™ GTX 980M GPU with model NP8672
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NP 7358

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THE BEST (TINY) CASE

Save some space under your desk and a little cash in your wallet with a killer microATX or Mini-ITX chassis

BY DAVID MURPHY

You don't need a massive case to have an amazing system. There, we said it. In fact, we'd almost argue that giant, mid-, and full-tower cases are becoming unnecessarily extravagant in today's era of computer components.

Think about it. What's the bare minimum you need for a killer desktop nowadays? Motherboard? Fast processor? Got it. Mini-ITX and microATX cases won't have a problem with that. Videocard? A good, small case should be able to handle anything you throw its way. Heck, go for two videocards if you can.

Storage? If you're a speed enthusiast, you're just going to need space for a single, huge SSD—which you can stick just about anywhere you want in a small case, even if you don't have a dedicated 2.5-inch bay for it (which you really should). Better cases will let you supplement a crazy-fast SSD with an easy-to-install, fat ol' hard drive. And there you have it: One great gaming rig, and you didn't need a case the height of your desk to get it done.

That said, there are plenty of peculiarities that can occur when manufacturers attempt to save as much space as possible in their small-chassis creations. And that's the most frustrating thing about these smaller cases—the possibility for error is a lot greater. Buy a poorly designed case, and you'll find yourself having a lot more difficult a time building your system. Or, worse, an uglier inside.

The cases in this roundup run the gamut of excellent, horrible, and outlandish design. However, we're happy to do the grunt work just so you can have a great experience with your next system build.

"One great gaming rig, and you didn't need a desk-high case to get it done."

LEFT: Seeing inside your case isn't vital, unless you want your rig to look as gorgeous as this Corsair Graphite 760T, of course. RIGHT: Saving cash and going budget doesn't have to mean you end up with rubbish, thanks to the likes of the Gigabyte GZ-MA02.

The main reason for investing in a new case is for a new build. When you're doing that, there's going to be some guesswork as to how the machine is actually going to be used. You may, for instance, discover the cooler you've got in mind doesn't quite cut it, and you might need to use a double-width radiator fan instead of a single one. You may realize you want that second graphics card after all, or that your motherboard's onboard audio doesn't produce the quality you were expecting and now you need to make way for an add-in card.

In other words, whenever you're building a new machine from scratch, you need some flexibility in the kind of case you're looking at to make sure none of these little hiccups result in you wasting money.

There are other reasons why you might be looking for a funky new chassis, but the chance of a case failing you or annoying you enough that you feel you need to replace it are fairly low. A new chassis won't make your games run smoother, it won't improve rendering times, and it won't make everything you do look even more awesome than it does already. Unless you have a serious problem with your current case, replacing it isn't going to have many tangible benefits to your day-to-day use.

What a good case will do, however, is give your components enough airflow to keep them working optimally. A good case won't rattle as the fans spin up, and will have all the ports and sockets within easy reach. It will also have enough space for your current components and to accommodate expansions as your needs change. A great case will make you want to put your build on show rather than hide it under your table.

STANDARDIZATION

Standards are core to the resilience of the PC. The fact that you could, in theory, have components in your current PC that have been with you for decades has helped it endure as a platform. While the practicalities of innovation mean that this unlikely to be the case, it's certainly possible that the evolution of the platform means that you're rocking a soundcard, a hard drive, a cooler, or even a case that predates the rest of your system. Key to this is the ATX specification, which has meant the core components of our systems are fundamentally compatible with each other.

There have been plenty of challenges to the ATX specification, but it remains the dominant standard for chassis, motherboards, and power supplies. This isn't a bad place to be on many levels, either. Knowing that the vast majority of motherboards you can buy will fit happily into the vast majority of cases, and that you'll be able to power that motherboard with the vast majority of power supplies makes life that much easier.

We emphasized the "vast majority" angle because, despite ATX's dominance, it isn't the only standard out there. Certain market sectors have focused on making smaller and smaller computers, and here the full-sized nature of the ATX specification makes less sense. If you can make a computer that's little bigger than a credit card and requires less than a watt of power to run, then there's no need for a specification that's designed to keep a power-hungry workstation running smoothly.

There are plenty of options on the small form factor side of things, with the likes of Intel's NUC and the Gigabyte BRIX opening new possibilities thanks to their tiny form factors. This is an area we can see expanding, especially as AMD and Intel are focusing on system on a chip designs. Such machines are a little specialist for general PC builds though, and tend to be sold either as fully functioning machines straight out of the box, or as barebones systems.

If you're looking to build a small machine from scratch, then your options basically come down to microATX or Mini-ITX designs. Of these you have more options

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Above: Small cases can house good water cooling, as this liquid-chilled machine proves. Below: The BitFenix Prodigy M is good for Mini-ITX and mATX mobos.

if you go down the mATX route, simply as there are more cases out there, and a lot more motherboards as well. MicroATX as a standard benefits from the fact that you can install a microATX motherboard inside a full ATX case too, which always gives you an upgrade path to a bigger machine.

THINK BIG

There are several factors that will determine the kind of chassis you're willing to look at. Size is important here—simply because you know how much space you have on (or under) your desk. There are a lot of unknowns for most of us when it comes to smaller cases though, with the perception being that the cooling in a smaller case isn't adequate for the sort of high-end components most of us have in mind. This isn't necessarily true though, with a swath of small chassis appearing recently that have been designed with gaming hardware in mind. We're specifically thinking about the likes of the BitFenix Prodigy, the Cooler Master Elite 120 Advanced, and Fractal Design's Nano.

Of course, if you're looking to build an SLI rig with loads of storage and the best processor around, overclocked to the max, then the space and versatility afforded by a big case is generally the way to go. Having said that though, there are microATX X99 motherboards available with twin PCIe x16 ports, so size isn't quite the limiting factor many think it is. Even so, when it comes to dropping serious money, we understand if you want to house your kit in a big, kick-ass case. Here the venerable Cosmos II is still an impressive chassis to consider, although the price you'll pay for such space can be eye-watering.

Beyond the space available inside the case, the other factors worth considering are general system airflow and acoustics. Airflow isn't just about the amount of fans installed with the case as standard, but how many mounting points there are and where they're situated. If you're looking to build a silent, or near silent, system then you're going to need to look at sound-absorbent materials and/or use a chassis designed for the task. Factoring in your CPU cooling is also vital.

Whatever you need, if you're mulling over going mini, read on for our six-page roundup of the variety of tiny cases currently on the market.

THE INCREDIBLE SHRINKING PC

If you've been in this game long enough, you'll recognize the likes of Nano-ITX, Pico-ITX, flexATX and other tiny form factors that have been tipped at one point or another as the next big thing. Most of these have disappeared without trace, mainly because they were niche options and the costs involved forced the end user price up to silly levels.

We doubt history will repeat itself with the second coming of the mini-PC though, as there's now a real place for them. Imagine these tiny systems as pimped streaming machines, which take the output from your big gaming rig and put its power at your disposal around the home. The possibilities are a lot more enticing than previously.

These machines aren't as dumb as they once were. They're powerful and usable in their own right. You aren't limited to using them solely as streaming machines—if you want to do some heavy surfing, productivity, or indeed gaming, you can. Intel's and AMD's graphics subsystems really are at the point where you can throw polygons around at smooth frame rates as long as you're prepared to make a few quality sacrifices. If you need the best settings, that's where in-home streaming steps in.

Such machines tend to be sold as barebones kits, but the likes of the Intel NUC are available without a chassis, which should lead to case manufacturers branching out of their microATX and Mini-ITX ways. If nothing else, you could follow Raspberry Pi's lead and build your own case. It's not as hard as you'd think.

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Lian-Li's microATX case is a bit on the big side, but you get a lot of options.

Lian-Li PC-V360

Plenty of customization, little headache

WITH ITS PC-V360 MID-TOWER CHASSIS, Lian-Li lives up to the company's expectations as a top case-maker and crafts up yet another winner. The case's all-aluminum construction feels a lot more durable than your typical aluminum-and-plastic variant from competing manufacturers. Perhaps it's a byproduct of Lian-Li's manufacturing process, but the PC-V360 feels rigid and strong. Its side panel pops off—no thumbscrews or screwdrivers necessary—to reveal a wealth of space on the inside. It's so roomy (and so wide), we're surprised Lian-Li didn't just go ahead and add a little extra vertical space and make the case completely ATX-compatible.

There's plenty of room inside the case for a microATX motherboard, and installing it is a simple process. You do, however, have to first unscrew the case's water-cooling bracket and pivot it a bit out of the way. Yes, this microATX chassis supports a two-bay radiator setup. Crazy, isn't it?

The motherboard tray is a bit raised off the chassis' side, which means you can neatly wrap and hide cables around the small gap between it and the side panel. That's great news for system builders who want to add a little touch of elegance to their builds, though you won't really notice it from the case's outside (as it lacks a side panel window to peer through).

The case's single 5.25-inch bay isn't screwless, but we appreciate that Lian-Li only gives you one of them. As a result, you get five 3.5-inch bays to work with (in a single, removable cage) and three 2.5-inch bays below it in a similarly removable cage. You can even transform one of those 3.5-inch bays into a 2.5-inch bay.

CAGE FIGHTING

So, if you're big on solid-state drives, you can just remove the middle drive cage and increase your case's airflow a little bit—a 12cm intake fan is wedged between said cage and the case's front. While the extra-wide case felt a smidge cramped for our GeForce GTX 480 card (as a result of the 2.5-inch cage), at least you can also remove the latter to increase the space if you don't plan to stash a ton of SSDs in your system.

As for installing the drives, you simply attach four screws (and four rubber mounts) to your drives, then slide them into place. A simple locking mechanism for all the drives ensures they won't slip out of the chassis if you happen to bump it—thankfully.

We didn't like the sideways positioning of the case's two USB 3.0 ports, as it means you can't really put the case's right half against a wall (or other object). The ports are also pretty low to the ground, which will give you quite a stretch if you're reaching down to access them from your desk. However, this is a minor quibble for such a great chassis. If you have a lot of crazy ideas for your next microATX rig, this highly customizable case will suit you well.

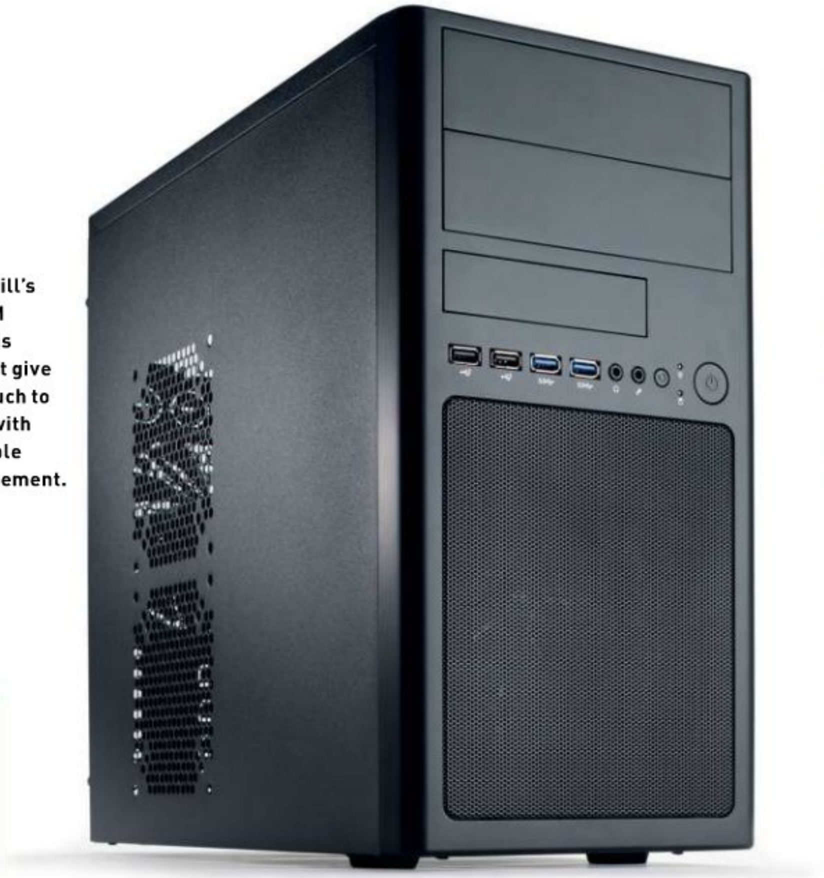
VERDICT
9

Lian-Li PC-V360

+ BRUCE LEE Solid construction; stacks of space; allows for plenty of build options.

− MINI-ME Annoying USB port positioning.

$130 (street), www.lian-li.com



Rosewill's Line-M Chassis doesn't give you much to work with for cable management.

Rosewill Line-M

A bit too tiny for our tastes

ROSEWILL'S LINE-M MICROATX CHASSIS looks pretty simple from the outside, but it's going to give you a bit of grief when you go to build the world's tiniest PC on the inside. While we appreciate Rosewill's intentions—sucking as much wasted space out of the 7.29 by 14.37 by 15.74-inch chassis as it possibly can—we did have a bit of difficulty during our system building.

Stashing a microATX board inside the chassis wasn't that tough, but we started to get concerned when we threw in our power supply. Though this is supposed to be a mini-tower chassis, there's no way to conceal cables whatsoever in the case. We suppose you could wedge all of your extra wiring in the case's 3.5-inch bay (in the manual, Rosewill thinks you'll use this for a floppy disk drive. Ha!), but that's not the most ideal treatment.

Installing optical drives into the case's single two free 5.25-inch bays is easy, and you don't even need screws to lock them into place. The aforementioned 3.5-inch bay uses a similar locking mechanism, but the holes don't line up with those found on 3.5-inch hard drives or 2.5-inch SSDs. You'll have to remove the connector, or ignore it, to just screw your hard drive into the case directly. Rosewill also provides two mounts below that for hard drives, but a 3.5-inch drive brushed right up against our RAM when we populated our motherboard's four memory slots with decently sized memory sticks. Have fun with the cabling on this one.

We do like the ample room Rosewill leaves for videocards of all sizes, and the case's cooling—a 12cm rear fan and blue 12cm front fan—is potent. Two USB 2.0 and two USB 3.0 ports round out the case's features; a nice addition, we just wish the insides were better-configured.

VERDICT 6

Rosewill Line-M

+ **MAJOR LEAGUE** Good cooling; lots of room for videocards; generous with USB ports.

− **LITTLE LEAGUE** Far from perfect design; very little space for cabling.

$40 (street), www.rosewill.com

MINI-ITX vs. MICROATX

Micro. Mini. It's all the same, right? We're just talking small motherboards—a miniaturized form factor compared to your traditional ATX motherboard, which is the thing that's likely sitting in your desktop PC right now. It sounds a bit like alphabet soup, but it's important to know the differences. There are differences, and they're critical in regards to just what you'll be able to put into the system you're planning to construct.

A good, tiny case should support both microATX and Mini-ITX. You'll want to triple-check this is accurate when purchasing a case, lest you be stuck with a mobo you can't screw into your chassis for whatever reason.

A Mini-ITX motherboard is smaller than a mATX motherboard, which is itself much smaller than a standard ATX motherboard. Mini-ITX motherboards only have two DIMM slots for memory, which could present an issue for those looking to cram their systems full of an absurd amount of RAM. The best ones only tend to have one expansion slot, though it's at least going to be a PCI Express x16 slot. And you'll likely find fewer SATA ports on a Mini-ITX motherboard, but you'll probably run out of space in a tiny case for drives before you run out of ports.

In contrast, mATX motherboards will have all four DIMM slots at the ready, and you'll get more expansion slots to play with. Ideally, you'll be able to SLI or Crossfire your videocards. You'll also probably get more USB ports, but the difference between six and eight isn't huge, to use one example (especially once you factor in your case's USB capabilities as well).

Silverstone PS08

Bring a screwdriver… and some grease

SILVERSTONE'S PS08 CASE is simple and small. The company went to great lengths to eliminate excess space from the case's inside, but we think the cuts ran too deep. We didn't have a horrible time building a normal system in this chassis, but we didn't have a great one, either.

The case's thumbscrews that hold its side panel in place were a little stiff when we went to remove them. We didn't have any troubles throwing in a microATX motherboard, but it's a tight fit against the start of the case's two 5.25-inch bays and four 3.5-inch bays. The case gives you a smidgen of room to run cables behind the motherboard, but it's not enough. Overlap your cables, and you'll likely create a little bulge in the case's plastic side panel.

Installing 5.25-inch devices into the case is easy, but it requires a screwdriver. The same goes for any 3.5-inch drives you stash into the PS08. You can screw a single SSD into the case's bottom, but that's all the support you get for 2.5-inch drives.

While the PS08 comes with ample room for videocards up to 14.1 inches in length, you can't actually stick one in horizontally. At least, not directly. You have to tilt the card to fit it below the case's drive bays, and then attach it to your motherboard as you normally would. We don't mind the treatment, though it's a pain to connect your videocard to your power supply afterward.

The case's front panel is pretty plain. Its drive bay covers are easy to remove and its two USB 3.0 ports are easy to access. The same holds true for the filter covering its single 12cm cooling fan. We'd prefer a second fan located on the case's top or rear for more cooling.

VERDICT 6

Silverstone PS08

⊞ **G.I. JANE** Covers easy to remove; accessible USB ports.

⊟ **PLAIN JANE** Very little space; building is frustrating; looks unexciting.

$40 (street), www.silverstonetek.com

Rosewill R363-M BK

It's so bad we're a bit baffled

NO, NO, NO. ROSEWILL gets so many things wrong with its R363-M chassis that we can't help but think this was a whiteboard brainstorm that accidentally got out of the lab and into production.

For starters, the case ships with a 400W power supply. We appreciate the move, but we feel it's completely unnecessary. If you're buying a barebones case, you're building a PC. You don't need hand-holding with your power supply. We'd rather have a lower price tag than a crappy, pre-installed PSU (with no 6- or 8-pin connections whatsoever for your videocard).

The case's two 5.25-inch bays require screws when you're installing devices. The case doesn't give you predrilled holes for the devices, just a single open bar of space that the screws grip the top and bottom of. The same is true for its two internal 3.5-inch bays, only, you don't even get a little tab for your hard drives or devices to sit on. They float in mid-air. We don't mind this treatment when hard drives sit in a drive bay via rubber grommets, but this is simply a cheaper implementation.

We don't know why Rosewill built a complicated mechanism for the case's single internal 3.5-inch bay when a simple thumbscrew would have worked fine. Nevertheless, you have to remove the bay to install a hard drive, and this is the only bay that actually comes with the correct holes predrilled for a drive.

The case's glossy black exterior looks amazing, though ours came scratched as shipped. It has two USB ports, but they're hidden on the bottom of the case's front panel by a push-locking cover. The case's power button is around here as well, which will a bit of a stretch from your desk if you place this case on the ground.

VERDICT 4

Rosewill R363-M BK

⊞ **SAN FRANCISCO BAY** Gorgeous.

⊟ **MICHAEL BAY** Excessive power supply; lack of predrilled holes; USB ports and power button too inaccessible.

$50 (street), www.rosewill.com

Not your average system build, it's as fun as it is challenging.

Silverstone Sugo SST-SG09B

Time to get crafty

SILVERSTONE TAKES THE CONCEPT of miniature case design to the next level with its SG09 case, a great option for beginners (and those with more experience) to work on their system-building wings. It's small, compact, and nothing like anything you've probably worked with before, but it's worth the extra time if you don't mind a challenge.

The case's multiple panels require a screwdriver to remove, but that's the least of your worries. A microATX motherboard fits—barely—and your typical 5.25-inch bay has been condensed to fit a slot-loading optical drive. It'll look good when you're done, but we doubt you have a slot-loading drive sitting around at home.

POWER PLAY

Two holes are all you get for cable management—a challenge, but not an impossibility. The power supply mounts in the case's front, and its cables will all wrap around to the right side. Silverstone's SG09 presents a pretty compelling argument for putting a modular power supply on your shopping list.

Two hard drives mount vertically on the case's right side, and four 2.5-inch solid-state drives can be screwed into the case in a similar fashion below that. It's good news that the case itself comes with ample cooling: a rear 12cm fan is joined by a 12cm fan on the case's left side panel and a huge 18cm fan on top. Plus, two USB 3.0 ports can be found placed conveniently on the case's front.

On its rear, we were a bit frustrated by the chassis' PCI brackets, which require a bit of unscrewing to manipulate. On the plus side, you can stuff a videocard up to 13.5 inches long into your system. Power-building challenge: accepted.

VERDICT
8

Silverstone Sugo SST-SG09B

+ **MACGYVER** Good-looking; offers a challenging but rewarding build; decent cooling.

− **MACGUFFIN** PCI brackets quite awkward; not much space.

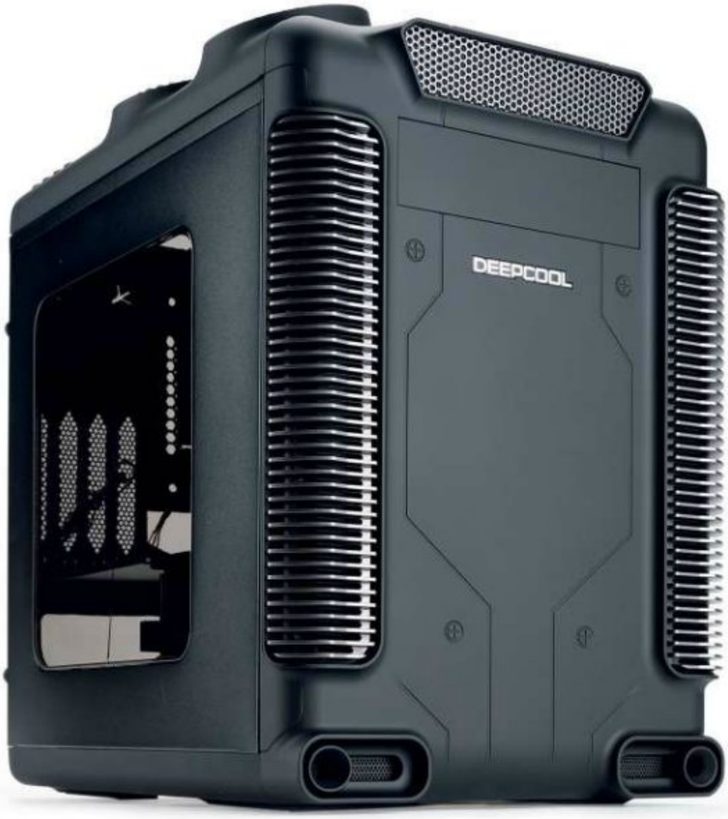
$100 (street), www.silverstonetek.com

THINGS TO CONSIDER WHEN BUYING A CASE

A great case shouldn't be a pain in the butt to install a system in. That's the easy answer. The harder part is defining just what that means—and how you can avoid turning a normal system build into a day-long affair.

We're big fans of cases that are screwless wherever possible. We don't want to have to bust out tools to take the side panel off, nor do we think you should have to screw in your optical drives and hard drives as long as its avoidable. As well, we like it when a case comes with 3.5-inch drive bays that can be easily repurposed for 2.5-inch SSDs. You'll have to screw in your mobo; there's no way around that, though we greatly prefer cases that give you a little wiggle room. Wedging a board into a case isn't an ideal practice.

Small cases need to have some good method for cable management and, no, stuffing all of your cables into a free drive bay isn't the answer. We'll gladly give up an inch or so of width so long as we can have some room behind the motherboard tray to work magic. Support for big videocards is a must, but we don't want to recommend a maximum size on this one. A prospective case should fit your parts; if you have a smaller videocard, you shouldn't rule out cases that support... smaller videocards. Finally, USB 3.0 ports are important, since that's the new standard. What's more important is that these ports, and the case's power button, are easily accessible. You shouldn't have to bust out a yoga move at your desk just to plug in storage or turn on your PC.



We love building in this, but we don't like that its gimmick lighting and fan controller don't work very well.

Deep Cool Steam Castle

A unique design that doesn't quite work

SUCH POTENTIAL, TRULY. We had high hopes for Deep Cool's Steam Castle chassis, as we haven't seen a microATX case with such a unique appearance in some time. The Steam Castle looks a bit like someone took a Jaeger from *Pacific Rim* and mashed it down into a 16-by-11-by-16.5-inch box. It's a bit bulky for the tiny motherboards it supports, but there's a lot going on inside this little fortress.

Your entire system rotates 90 degrees when you stash it inside the Steam Castle, as the motherboard tray sits on the bottom of the case's upper-half—it's not vertical, like most cases you've probably worked with. That does pose a bit of a dilemma for screwing in the mobo to its standoffs, but the top of Deep Cool's case is easy enough to pop off, granting you plenty of access with a screwdriver. We also love that the case's PCI brackets are locked in with a mechanism that only demands you loosen or tighten a single thumbscrew. Excellent.

The case's 5.25-inch bay requires screws, though it's easy to pop off the case's front panel and remove the drive bay's cover. Its 3.5-inch bay below that also requires screws, but it can hold a 3.5-inch hard drive or 2.5-inch SSD.

The other drive bays are found in its front, directly in front of its huge 20cm fan, and to the right of where you install your power supply on the case's bottom (nearly touching the right side panel). The front bay is entirely screwless; you can either use the provided trays to quickly lock up to two 3.5-inch drives or you can bust out the screwdriver and attach two SSDs. The case's other bay only fits 2.5-inch drives, but it's screwless as well—locking mechanisms this time, not drive trays, though you have to pop off the right side panel to best reach it.

SEE THE LIGHT

The major theme of the Steam Castle is more its external design than anything else. The case's smooth, black exterior is punctuated by what would be four big turbines on its top, were the case an aircraft. We actually thought these were pre-installed fans at first, so it was a bit of a letdown—but not much—when we found they were actually LED lights that glowed red, green, or blue. A dial on the case's side controls the lights and, presumably, up to three fans connected to the case's built-in controller. The dial isn't the most accurate for turning the case's lighting up and down, and it did nothing for the connected fans.

Since said dial, as well as the power button, two USB 3.0 ports, and two USB 2.0 ports are on the right side panel, you're limited to where you can put this case. While we love Deep Cool's ingenious internals, the case's poorer performance for its primary element—lighting and fan control—leave us less than thrilled. Fix this up, and Deep Cool will have one of the best cases around.

VERDICT

7

Deep Cool Steam Castle

+ COOL AS ICE Looks fantastic; well-designed insides are easy to work with.

− WILLING TO SACRIFICE Bit bulky; needs to sort out lighting and fan issues.

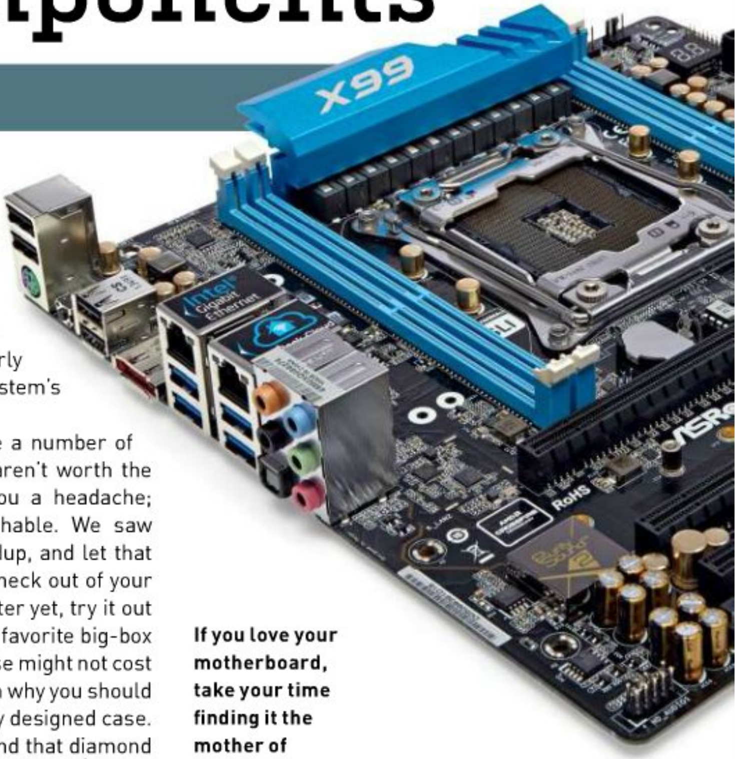
$90 (street), www.deepcool.com

A Good Home for Your Beloved Components

It shouldn't be a big surprise that one of our best-performing Mini-ITX/mATX cases is also one of the biggest. Aside from the fact Lian-Li knows what it's doing, it's just downright difficult to craft up a well-working design in a very tight space. Sacrifices have to be made, and we often find manufacturers are a bit too willing to prioritize size over usefulness. Or, worse, they pack their smaller cases with some gimmick that's awesome on paper, but not all that practical (or good) in real life.

That said, moving from a more conventional mid-tower chassis to a smaller design doesn't necessarily mean you'll have a worse building experience. If anything, some of the more creatively designed cases—such as Silverstone's Sugo SG09—present a wonderful challenge for a novice-to-intermediate builder to tackle. They're tricky to work with, but not impossible, and the payoffs can be great: a svelte, souped-up system whose cables are all tucked neatly away and whose cooling is fairly formidable thanks to the system's smaller design.

Unfortunately, there are a number of smaller chassis that just aren't worth the trouble. Some will give you a headache; some are downright laughable. We saw the full range in this roundup, and let that be a lesson. Research the heck out of your case before you buy or, better yet, try it out at a friend's house (or your favorite big-box store, if they'll let you). These might not cost much, but there's no reason why you should plunk down $50 for a poorly designed case. Save your cents until you find that diamond in the rough. Trust us, it's worth it. ⏻



If you love your motherboard, take your time finding it the mother of all (mini) homes.

SPECIFICATIONS

	Lian-Li PC-V360	Rosewill Line-M	Silverstone PS08	Rosewill R363-M BK	Silverstone Sugo SST-SG09B	Deep Cool Steam Castle
Dimensions (W x H x D)	7 x 15.3 x 18.9 inches	7.3 x 14.4 x 15.7 inches	6.6 x 24 x 15.7 inches	7.2 x 14.3 x 15.4 inches	8.66x11.6x13.9 inches	7 x 16.5 x 16 inches
Included Fans	14cm front, 12cm top	12cm front blue LED, 12cm rear	12cm front	9cm rear	12cm rear, 12cm side, 18cm top	12cm rear, 20cm front
Additional Fan Mounts	2x 12cm side	2x 12cm side	8cm front, 8/9cm rear	None	2x 8cm side	2x 12/14cm top
Drive Bays	5x 3.5, 3x 2.5	2x 5.25, 3x 3.5	2x 5.25, 4x 3.5, 1x 2.5	2x 5.25, 3x 3.5	1x slim optical, 2x 3.5, 4x 2.5	1x 5.25, 3x 3.5, 2x 2.5
Max GPU Length	12.2 inches	12.5 inches	14.1 inches	Undeclared	13.3 inches	12.6 inches
Mobos Supported	MicroATX	MicroATX	MicroATX, Mini-ITX	MicroATX	MicroATX, Mini-ITX	MicroATX, Mini-ITX
Connectors	2x USB 3.0	2x USB 3.0	2x USB 3.0	2x USB 2.0	2x USB 3.0	2x USB 3.0, 2x USB 2.0
Weight	12.1lb	7lb	7.62lb	13lb	11.7lb	15lb
Price	$130	$40	$40	$50	$100	$90
Test Score	9	6	6	4	8	7

GET MORE SPEED FOR FREE!

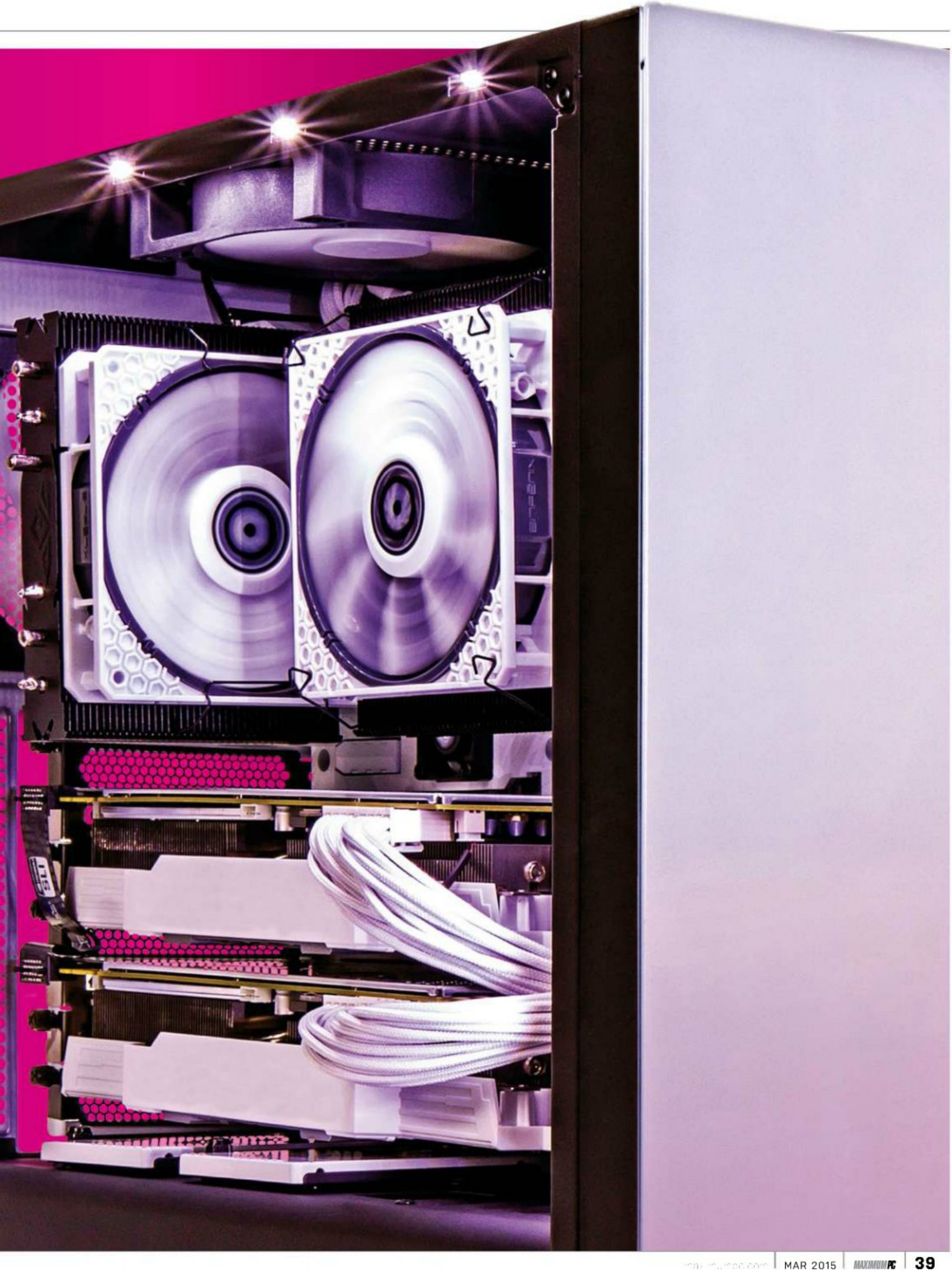
52 Time-Saving Tips and Tricks

BY ALEX CASTLE

After a while, every PC starts to show its age. Programs that used to be lightning fast suddenly start to go slow. Tasks that used to take five minutes now take 10. Using your computer for anything in fact starts to feel like a chore. In short, a once-lovely machine becomes a liability, dragging your productivity through the dirt and wasting your precious time.

Fortunately, there's always a way to speed up a PC, whether it's a 7-year-old clunker or last year's model that's just starting to slow. Hell, you can even wring some extra performance out of a brand new PC, if you know what to do. In this article, we're going to share a whopping 52 ways to get more horsepower out of any PC, covering hardware, software, and operating system tweaks. Best of all, each one of them is completely free. Everyone who's ever said there's no such thing as a free lunch is wrong—you can reclaim lost speed without ever spending a cent. Why not start right now?

COVER & MAIN FEATURE IMAGE: OVERCLOCKERS UK|WWW.OVERCLOCKERS.CO.UK



SORT OUT YOUR SOFTWARE

Transform your PC into a steroid-stacked sprinter by fine tuning your OS and other software

Although a computer is a machine, the most common sources of slowdown are anything but mechanical. Instead, it's the operating system and software that cause most of the problems that can turn a new computer into a plodding soul-destroying mess. And it's those same two layers where most of the easiest performance gains are to be found.

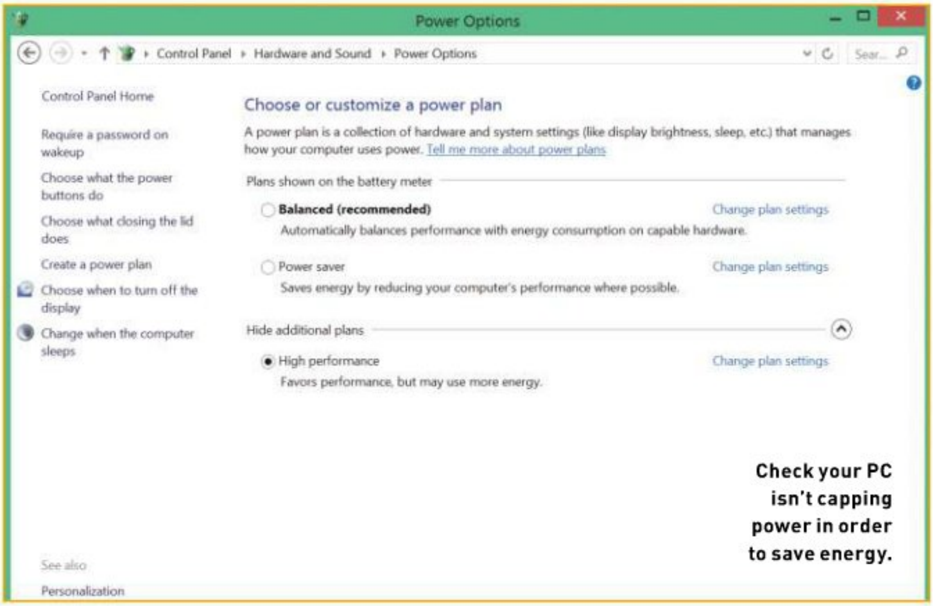
On the following pages, we're going to look at fixes for common software speedbumps, as well as Windows tweaks that will get your computer running faster than ever before.

OS TWEAKS

The operating system you're using is the foundation of your computer, which means that even the fastest software will limp slowly if the operating system it runs on is sluggish and simply not up to the task. Accordingly, the first place you should always look for speed-boosting tweaks is within Windows itself.

1 CHANGE THE POWER SETTINGS TO HIGH PERFORMANCE

If your computer seems like it's going slower than it should, check the Power Options menu in the Hardware and Sound section of the Control Panel and make sure you have the "High Performance" setting selected. On a laptop, Windows will sacrifice performance in the name of increased battery life, by putting components like hard drives to sleep faster, or even capping the maximum output of the CPU. For fine-grained control over your PC's power settings, click the "Change plan settings" link next to the power plan you've selected, then click "Change advanced settings."



Power Options
Control Panel ▸ Hardware and Sound ▸ Power Options
Sear...
Control Panel Home
Require a password on wakeup
Choose what the power buttons do
Choose what closing the lid does
Create a power plan
Choose when to turn off the display
Change when the computer sleeps
See also
Personalization

Choose or customize a power plan

A power plan is a collection of hardware and system settings (like display brightness, sleep, etc.) that manages how your computer uses power. Tell me more about power plans

Plans shown on the battery meter

○ **Balanced (recommended)** Change plan settings
Automatically balances performance with energy consumption on capable hardware.

○ Power saver Change plan settings
Saves energy by reducing your computer's performance where possible.

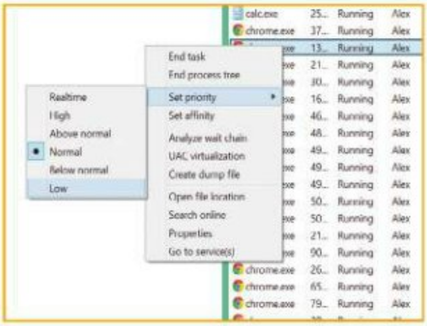
Hide additional plans

● High performance Change plan settings
Favors performance, but may use more energy.

Check your PC isn't capping power in order to save energy.

2 TURN OFF AERO

First introduced in Windows Vista, Aero is the name for the set of interface eye candy that includes transparent UI elements and animated window transitions. It makes post-XP Windows look slicker and more modern, but it can also have a surprising effect on system performance. In particular, older systems without discrete graphics hardware can get a substantial performance boost by disabling Aero in the Appearance section of the Control Panel. Yes, you'll miss out on a bit of graphical flair, but the actual functioning of Windows will be completely unaffected.



calc.exe 25... Running Alex
chrome.exe 37... Running Alex
End task
End process tree
Set priority
Set affinity
Analyze wait chain
UAC virtualization
Create dump file
Open file location
Search online
Properties
Go to service(s)
Realtime
High
Above normal
● Normal
Below normal
Low
chrome.exe 26... Running Alex
chrome.exe 65... Running Alex
chrome.exe 79... Running Alex

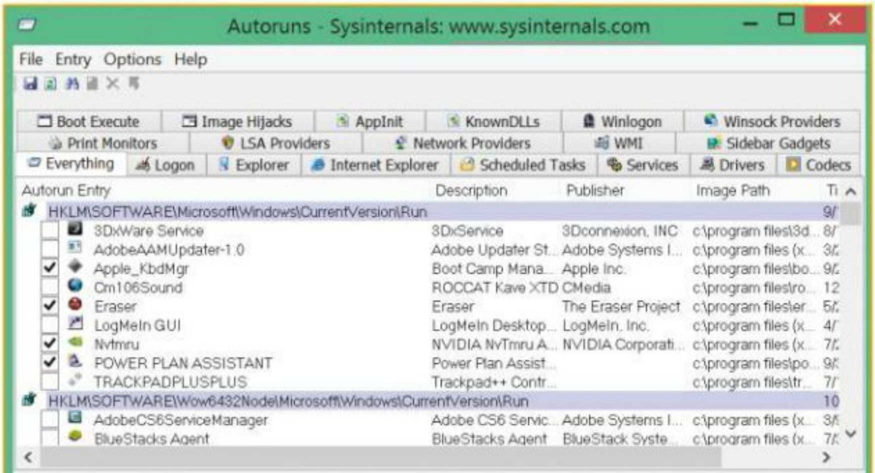
3 MANUALLY SET THE PROCESSOR PRIORITY LEVEL

Nothing will bring your computer grinding to a halt faster than a program that's monopolizing your processor. Even if your PC isn't actually locked up, other software you try and use will be miserably laggy. When the resource-hogging program in question is something you actually need to let finish, it can leave you with no good option—you either don't let the program finish, or you give up on doing anything else until it's done. Fortunately, Windows has an easy way to manually set processor priority. Just open the Task Manager, click over to the "Processes" or "Details" tab, then right-click on the offending program, and set the priority to "Low." Now Windows will know to allocate resources to other programs first, and your original program will still be able to complete without a fuss.

4 USE RESOURCE MONITOR TO SPOT THE SLOWPOKES

Speaking of the Task Manager, you should know there's a more powerful version of that tool built right into Windows 7, 8, and Vista. Just open the Task Manager,

37 Reboot! It has to be said—a lot of problems will be solved with a system reboot. 38 Restart the router Mysterious problems
taskbar app by hitting WIN and the number key corresponding to that program's position on the taskbar. 40 Switch to OpenDNS



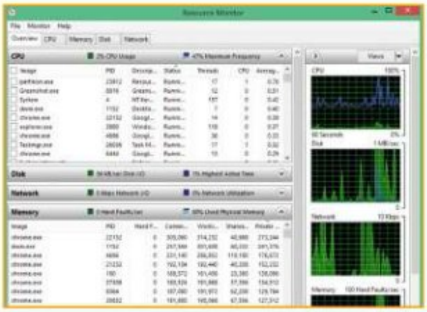
	Autorun Entry	Description	Publisher	Image Path	Ti
	HKLM\SOFTWARE\Microsoft\Windows\CurrentVersion\Run				9/
☐	3DxWare Service	3DxService	3Dconnexion, INC	c:\program files\3d...	8/
☐	AdobeAAMUpdater-1.0	Adobe Updater St...	Adobe Systems I...	c:\program files (x...	3/
☑	Apple_KbdMgr	Boot Camp Mana...	Apple Inc.	c:\program files\bo...	9/
☐	Cm106Sound	ROCCAT Kave XTD	CMedia	c:\program files\ro...	12
☑	Eraser	Eraser	The Eraser Project	c:\program files\er...	5/
☐	LogMeIn GUI	LogMeIn Desktop...	LogMeIn, Inc.	c:\program files (x...	4/
☑	Nvtmru	NVIDIA NvTmru A...	NVIDIA Corporati...	c:\program files (x...	7/
☑	POWER PLAN ASSISTANT	Power Plan Assist...		c:\program files\po...	9/
☐	TRACKPADPLUSPLUS	Trackpad++ Contr...		c:\program files\tr...	7/
	HKLM\SOFTWARE\Wow6432Node\Microsoft\Windows\CurrentVersion\Run				10
☐	AdobeCS6ServiceManager	Adobe CS6 Servic...	Adobe Systems I...	c:\program files (x...	3/
☐	BlueStacks Agent	BlueStacks Agent	BlueStack Syste...	c:\program files (x...	7/

Use Autoruns to discover what software automatically starts up every time you turn on your PC.

then click on the "Performance" tab. Towards the bottom of that menu, you'll see a button to open the Resource Monitor. The Resource Monitor is an exceptional tool for finding the programs that are slowing down your PC, with very detailed usage charts for CPU, memory, hard disk space, and even network bandwidth that they're taking up.

5 CLEAN UP YOUR STARTUP FOLDER

A major sign of a computer in need of maintenance is a slow boot time. If your computer takes forever to get started, it generally means you've got a lot of software starting up whenever your operating system starts. That's bad for a number of reasons. First, it means Windows has to get more done before it finishes booting. Also, all that software running in the background drains system resources and causes an overall slowdown. One of the best things you can do to speed up your PC is to use a free program such as Autoruns (http://bit.ly/MIIdLk) to examine what's starting up with your PC. Chances are you'll find a lot of stuff on the list that shouldn't be there. Have a thorough look through it and disable anything you really don't need.



Resource Monitor will hunt down the programs making your PC run slower.

OTHER SOFTWARE TWEAKS

Software can be part of the problem or part of the solution. Some programs are well-intentioned, but make your whole system slower, while others are actively malicious. On the other hand, the right software can help you reclaim lost speed and keep you safe. In this section we'll look at both.

6 CLEAR UP WASTED SPACE WITH CCLEANER

It never pays to be a software hoarder. As with the startup folder items described in the previous tip, excess installed software eats up your hard drive space and jams up your Start Menu, context menus, and more. You can try and uninstall unnecessary programs by hand, but it's a lot easier with the aid of an uninstaller app such as CCleaner, which presents a list of your installed applications, and lets you perform one-click uninstalls. Visit www.piriform.com/ccleaner to download it.

7 DO A MALWARE SCAN

If your computer has experienced a sudden and dramatic slowdown, the most likely culprit is malware. Even if you're sure you never installed anything untoward, it's a good idea to periodically run a malware scan. You can't go wrong with Malwarebyte Anti-Malware (www.malwarebytes.org).

8 DROP THE COMMERCIAL ANTIVIRUS

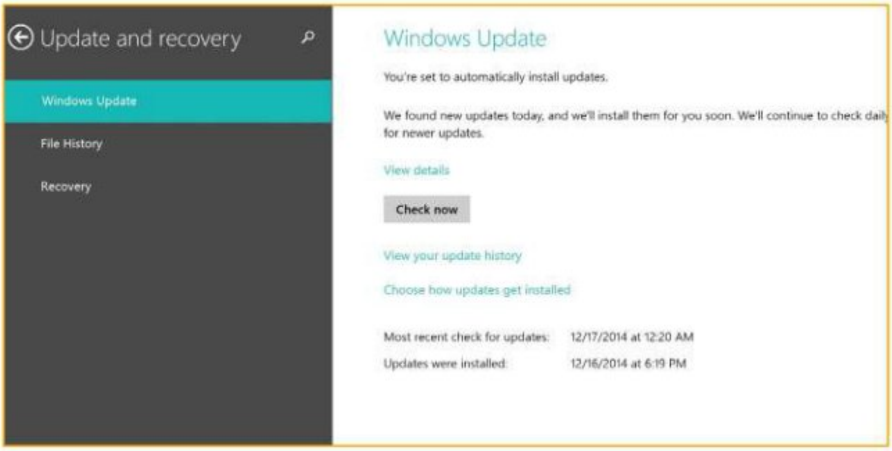
These days, commercial antivirus is likely to cause as many problems as it fixes. If you keep Windows current, then the included Windows Defender antivirus will be enough to protect your computer from common attacks. Practice basic web safety (don't open email attachments from people you don't know, etc.) and you'll stay safe without any security bloatware.

9 MAKE SURE WINDOWS IS ALWAYS UP TO DATE

As described previously, you have to keep Windows current in order for Defender to do its job. Automatic updates might be a pain when they happen, but you'll save time in the long run if you keep your computer secure. You can find Windows update settings in the System and Security tab of the Control Panel.

10 UPDATE YOUR VIDEO DRIVER

Most drivers are handled automatically these days, but you should still regularly check your video driver is up to date, especially if you plan to do any gaming. The video driver is performance-critical, and can be the source of a lot of in-game glitches. Additionally, updates are frequently published that increase speed in newly released games, so check back often and you might be pleasantly surprised.



You're set to automatically install updates.

We found new updates today, and we'll install them for you soon. We'll continue to check dail for newer updates.

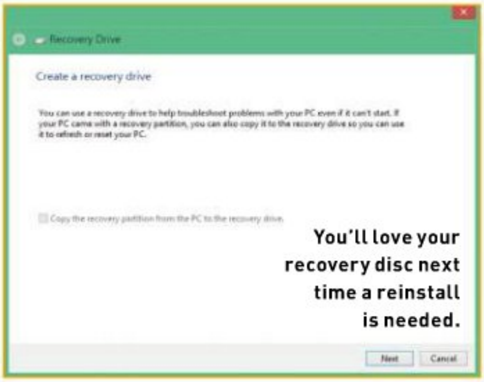
Most recent check for updates: 12/17/2014 at 12:20 AM
Updates were installed: 12/16/2014 at 6:19 PM

Keeping Windows updated helps Defender do its antivirus job.

plaguing your Internet connection? A simple router/modem reboot can help. *39* Launch taskbar apps with a hotkey Launch any
If your ISP's DNS server is slow, web pages will take a long time to load. Switch to OpenDNS at www.opendns.com. *41* Move files

MORE SOFTWARE TWEAKS

From Linux to LibreOffice, don't be scared to try the alternatives



Recovery Drive

Create a recovery drive

You can use a recovery drive to help troubleshoot problems with your PC even if it can't start. If your PC came with a recovery partition, you can also copy it to the recovery drive so you can use it to refresh or reset your PC.

☐ Copy the recovery partition from the PC to the recovery drive.

Next
Cancel

You'll love your recovery disc next time a reinstall is needed.

REINSTALL WINDOWS

Most of the issues that slow your computer down can be fixed with a little TLC. As we've been discussing, malware can be cleaned up, application clutter can be pruned, and so forth. Still, sometimes a computer can become so completely, utterly hosed that no amount of maintenance can fix it. The only way to unhose such a machine is to start fresh with a new Windows installation. If you've reached that point with your computer, here's a few things to keep in mind as you reinstall Windows.

11 RECLAIM YOUR PRODUCT KEYS

It's frustrating to reinstall your OS only to realize you've forgotten a CD key and can't reinstall important software. A program such as Enchanted Key Finder (sourceforge.net/projects/ekeyfinder/) can automatically find most or all of the active CD keys on your system. Especially for industry-level applications like Photoshop, you should manually deactivate your software before uninstalling, in order to save yourself time later on.

12 MAKE A RECOVERY DISC

Make your life easier next time you have to reinstall by creating a recovery disc of your newly clean PC. In Windows 8, you access the recovery media utility by opening the Start screen, typing "recovery" and selecting the option labelled "Create a recovery drive." The recovery drive will allow you to restore your computer to exactly this lovely fresh state without having to do a full reinstall.

13 BACK UP YOUR FILES

This goes without saying, and is something you should be doing anyway. Make sure you've got all your important files backed up to an external drive or the cloud. Even if your files are on a separate partition from your Windows install, it's better to be safe than sorry.

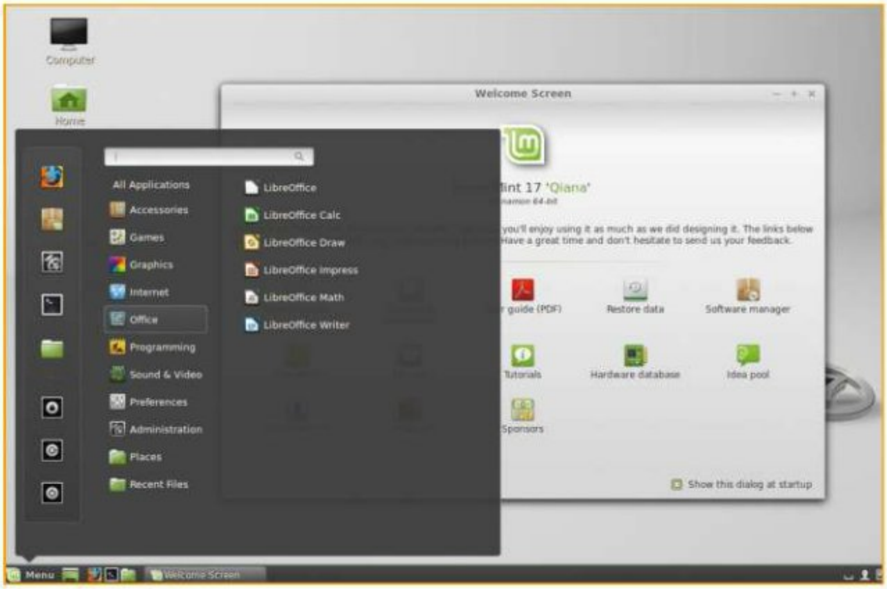
TRY A DIFFERENT OS

Though we're generally big fans of Windows, we'd be remiss if we didn't mention that reinstalling Windows isn't the only way to get a clean start.

14 MINTY FRESH

You could also try a shiny new installation of a free alternative OS from the Linux family. Linux OSes are lighter-weight than Windows, and generally have much easier system requirements. You can install one as a secondary OS, and only boot to it when you want a more minimal desktop experience. If you've never tried Linux before, it might seem daunting, but it's actually not that tricky with today's user-friendly Linux distros. In fact, the hardest part might be picking which distro (a specific Linux-based operating system) to install. For years, the standard recommendation for newbies has been Ubuntu, which is polished, well-supported and very user friendly. It's still a great option, but lately we've taken to recommending Linux Mint (www.linuxmint.com) instead.

Linux Mint is based on Ubuntu, and offers the same professional-quality experience and easy installation. Where it differs is in the user interface—the UI in Mint is a little more minimalist and will be more familiar to those coming from Microsoft OSes. There will obviously still be a learning curve, but you can generally get set up with a fully functional Linux desktop in an afternoon.



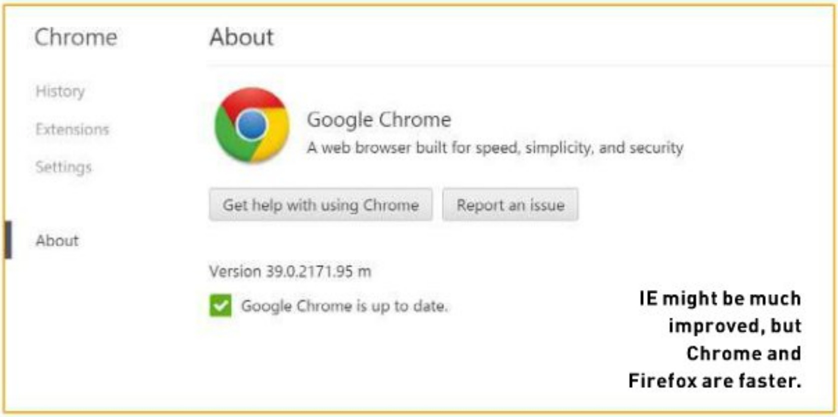
Computer
Home
Welcome Screen
All Applications
Accessories
Games
Graphics
Internet
Office
Programming
Sound & Video
Preferences
Administration
Places
Recent Files
LibreOffice
LibreOffice Calc
LibreOffice Draw
LibreOffice Impress
LibreOffice Math
LibreOffice Writer
int 17 'Qiana'
r guide (PDF)
Restore data
Software manager
Tutorials
Hardware database
Idea pool
Sponsors
Show this dialog at startup
Menu
Welcome Screen

you'll enjoy using it as much as we did designing it. The links below Have a great time and don't hesitate to send us your feedback.

Alternative operating systems such as Linux Mint are less demanding on your system.

quick with Send To Right-click a file and expand the Send To options to immediately move it to a number of commonly accessed

prompt anywhere In File Explorer, hold Shift and right-click in a folder. You'll see an option to open a new command prompt in



Google Chrome

A web browser built for speed, simplicity, and security

Version 39.0.2171.95 m

☑ Google Chrome is up to date.

IE might be much improved, but Chrome and Firefox are faster.

TRY A FEW DIFFERENT APPS

Sometimes the best way to get a quick performance boost is to replace an often-used piece of software with a speedier alternative. That can mean giving up some functionality, but more often than not that's a tradeoff worth making. Here are five common apps you might replace:

15 INTERNET EXPLORER

It used to be the case that the best advice you could give someone regarding their web browser was to drop Internet Explorer as fast as humanly possible. Fortunately, IE isn't the absolute stinker it used to be, and IE 11 is actually very competitive in some benchmarks, such as JavaScript performance, where it blows away the competition.

Still, for most common browsing, you're going to see a speed increase if you switch from IE to Chrome or Firefox. Chrome is arguably the fastest of the bunch overall, but it's also noticeably more system resource intensive than Firefox, so if you're trying to speed up an old PC, the latter might be a better choice.

16 MICROSOFT WORD

Microsoft Word is the industry standard for text editing, but its expansive feature set comes at a hefty price to your system's resources. Ask yourself if you really need everything that Word has to offer, and if you wouldn't be better off using an alternative.

If you need a full-featured word processor with a smaller footprint, you can try Writer, part of the LibreOffice suite of free Office replacement applications. It offers nearly all the features of Word, with a much lighter set of system requirements. If you want to do some very light writing or note taking, consider the WordPad app that comes installed with Windows—it's low on features, but very fast.

17 PHOTOSHOP

Adobe's Photoshop is another widely-used app that can put a major strain on your system resources. If you're using an older system that's not up to running Photoshop CC (or if you just want to save a lot of cash), check out GIMP (www.gimp.org). It's an open-source image editor that can do almost everything Photoshop can. The interface is a little clunky and has a steepish learning curve, but GIMP will run much better on old PCs than newer versions of Photoshop.

18 ADOBE READER

Not to spend too much time harping on about Adobe, but the basic PDF Reader is one of the slowest, most frustrating pieces of software on your computer. You wouldn't think something as simple as displaying a multimedia document (which your browser does in fractions of a second) would be slow and require a bulky install—and it doesn't have to.

To reclaim lost speed, install the alternative, a free version of Foxit reader (http://bit.ly/1D9SjfT). It has a nice interface, takes up very little disk space, and runs faster than your chunky old Adobe Reader.

19 REPLACE WINDOWS MEDIA PLAYER WITH VLC

Speed is only one of the many reasons to replace the default Windows Media Player with a different application, such as the excellent VLC (www.videolan.org). Though VLC is quicker to start playback on media files, the real time savings come from the app's flexibility. Watching a video in other players can be a stop-and-go experience involving tracking down codecs or differently formatted media files. With VLC, you know most any file will just work, and it'll work fast.

EVEN MORE SOFTWARE TWEAKS

20 HAND-TUNE GRAPHICS SETTINGS IN GAMES

If you're experiencing slowdown in games, make sure you're taking advantage of customization options available in the preferences menu. Lowering resolution is the obvious way to get better performance, but make sure you're looking at other options as well—turning down antialiasing or shadow quality can make a huge difference.

21 CUSTOMIZE YOUR GRAPHICS SETTINGS AUTOMATICALLY

Try out GeForce Experience (for NVIDIA GPUs) or AMD Gaming Evolved, both of which automatically tweak game settings. They profile your hardware, then consult a constantly refined database of hardware data to suggest optimum settings, without any trial and error.

22 LEARN TO LOVE JUMPLISTS

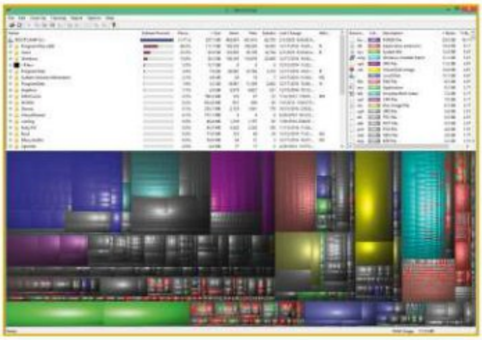
Introduced in Windows 7, jumplists are a fast way to access recent or frequently used documents or features of programs. Instead of left-clicking on an icon to open it, right-click on it instead—you'll see a context-sensitive list of shortcuts or documents for that program.

23 FREE UP DISK SPACE

Freeing up hard drive space won't always make your computer faster, but it can make a big difference if your drives are almost at capacity. If you're having a hard time figuring out what to delete, use a free drive visualizer such as WinDirStat (windirstat.info) to pinpoint greedy programs and docs.

24 CLEAR UP UNNECESSARY BROWSER EXTENSIONS

It's great how extendable modern browsers are, but it's easy to slow down your web browsing by installing too



If you're unsure what to delete from your hard drive, WinDirStat will help.

folders. *42* Minimize everything in a hurry Press WIN + M to minimize every open window straight away. *43* Open a command
this location. *44* Switch to full screen and back If you like to switch in and out of full-screen view in your web browser, use F11

many add-ons and extensions. Go into the settings for your browser, and make sure you actually use any active extensions. If you have a toolbar that you can't figure out how to uninstall, try CCleaner, described on page 41.

25 INSTALL AN AD-BLOCKER

Not every extension slows down your browser. A good ad blocker (like AdBlock or AdBlock Plus) will speed up your browsing a lot, by preventing web ads from loading. Just search for "AdBlock," plus the name of your preferred browser—it's free and installs in seconds.

26 SPEED UP YOUR FILE SELECTION WITH SELECT-INVERSE

If you've ever found yourself trying to select all but a few files in a large list, you know it can be an exercise in tedium and frustration. Rather than wearing your left-click button out, try this neat trick: Just hold Control and select the files you *don't* want, then click on "Invert Selection" in the options menu.

27 INSTALL EVERYTHING FOR FASTER SEARCHES

Windows search has gotten a lot faster over the years, but it can still be slow, particularly if you're searching for a file outside the User folder. For near-instant searching through every file on your PC, download the free program Everything from www.voidtools.com.

28 LAUNCH ANOTHER INSTANCE FAST WITH SHIFT-CLICK

There's a fast way to open up a second window or document in a program that supports multiple simultaneous instances (like your web browser, or Microsoft Word). Instead of manually creating a new doc, just hold down the Shift key and click on the taskbar icon for the program. Clicking the middle mouse button will do the same thing.

29 SET UP YOUR FAVORITE FOLDERS

A lot of users overlook one of the handiest features in the File Explorer: the favorite locations list in the upper left. If you find yourself frequently navigating to the same file location, save it to the Favorites for easy access. All you have to do is drag the folder to the Favorites area, and it'll be saved forever.

OVERCLOCKING

Become an expert in getting the most out of your hardware

If you've never done it before, overclocking might seem like black magic. The practitioner delves into the shadowy, mysterious world of the BIOS, tweaks some arcane symbols, and when they resurface, the PC is somehow faster.

But the truth is, anyone with the right hardware can overclock with just a little patience. Here we'll talk about overclocking every part of your PC, from the CPU to the GPU to the RAM.

We should mention that the guides presented in this section are very cursory—there's just not enough space to really get into the details of the overclocking procedure. That said, we've tried to give you a good idea of the basic process involved. There's a ton of information about overclocking available online, and we encourage you to search for info pertaining to your specific hardware before jumping in.

If you follow these procedures you're very unlikely to damage your hardware, but a component-specific guide can reduce the guesswork required.

CPU

Before we get into the process, we should point out that only certain CPUs can be overclocked, so you should do a search to see if you have an "unlocked" processor. The basic rule for recent Intel processors is that CPUs with model numbers ending in the letter "K" are unlocked.

30 PROCESSOR OC'ING

For space purposes this guide will only discuss Intel CPUs, but the basic process is the same for AMD chips. You'll also need a motherboard with overclocking capabilities. The Intel mobos with model numbers starting with "Z" are overclocking-ready, but for other brands you'll have to search to find out if yours can overclock. Finally, for all but the smallest overclocks, you will almost certainly want an aftermarket CPU cooler.

STEP 1 GET READY

There are several apps you need while you overclock your CPU. First, you'll need CPU-Z (http://bit.ly/QhR6xF), an application which allows you to view detailed information about your CPU from within Windows. The actual overclocking will be done in the BIOS, but CPU-Z will let you make sure your settings are properly applied during testing. You'll also need RealTemp (http://bit.ly/JBWaJA), which shows you your CPU temperature, and Prime95 (http://bit.ly/1kVNJZh), to stress-test the CPU.

Once you've installed the necessary software, reboot and press whatever keys are required to get into your motherboard's BIOS. If you don't know those keys and it doesn't say during the boot sequence, you'll have to do a web search.

STEP 2 ADJUST THE MULTIPLIER

Once in the BIOS, you'll need to find the settings menu for adjusting CPU performance. This will probably be easier if you search for documentation about your particular motherboard, but you can also just look for the menu that features options like "baseclock," "core voltage," and "CPU Ratio." That last option is what we want to increase. Upping the CPU Ratio by one (from 34 to 35, for instance), increases the final clock speed of the CPU by 0.1GHz (from 3.4GHz to 3.5GHz). To successfully overclock the CPU, we'll increase this multiplier by one, save, and reboot the OS.

STEP 3 TEST AND ADJUST VOLTAGES

Now that we've performed a small overclock, we need to make sure everything's still working. In Windows, launch CPU-Z and check the ratio (also called a "multiplier") is what you set it to. Next, load up RealTemp and then run Prime95, while watching your core temperature. If your CPU temperature rises above 80 C, then your overclock is unstable and may degrade your CPU—you'll have to

to do it quick. 45 Open the Run menu fast The Run dialog option lets you open almost anything. Get there fast with WIN + R. Send Windows to the sides of the screen To quickly snap windows to either side of the screen in Windows 7 and 8, hold WIN

GPU

For a gaming PC, your GPU performance may well be more important than your processor's. Most modern games are GPU-bound, so eking a little more performance out of your GPU will have a more dramatic effect on your gaming experience than a similar improvement in the CPU.

31 MORE GRAPHICS GRUNT

Fortunately, basic GPU overclocking has become incredibly simple in recent years, thanks to very user-friendly overclocking tools that do most of the heavy lifting for you.

If you have an NVIDIA card, grab EVGA PrecisionX from www.evga.com/precision/ (note it doesn't have to be an EVGA card), or if your card is AMD you can actually overclock it directly from the Catalyst Control Centre.

Intel CPUs with model numbers ending in the letter "K" are unlocked.

boot back into the BIOS and return the multiplier to its previous setting. On the first test, this shouldn't be the case. Alternatively, Prime95 might throw up an error, or your computer might crash. If that happens, your voltage is too low.

STEP 4 ADJUST VOLTAGES AND REPEAT

Whatever happens, restart your PC and boot back into the BIOS. If you had no issues whatsoever, just increase the multiplier by one more and go back to Step 3. If you experienced a glitch or a crash, you need to crank up the CPU voltage, so increment that value by .05. It's a good idea to do a search for the maximum safe voltage for your particular CPU. Return to Step 3 and repeat the process, increasing the multiplier when possible and voltage as needed, until your temperature gets too high or you approach the maximum safe voltage.

Overclocking your graphics card will have the biggest effect on gaming.

STEP 1 BENCHMARK

Before you begin, you'll need to download a suitable benchmark, which serves two purposes. First, it will allow you to quantify your computer's graphics performance, so you can tell how much of a difference your overclocking actually makes. Second, running the benchmark acts as a stress-test on your graphics card, so that as you tweak your overclock settings you'll quickly see if you've pushed things too far.

Visit unigine.com/products/heaven/ to download Heaven, the current standard for graphics benchmarks. Set a baseline by running through it once at full-screen resolution. Record your results.

STEP 2 MEMORY

In your overclocking software, you'll see sliders for power limit, memory clock and core clock. We'd adjust all of these, starting with the power limit. Simply set it as high as it will go.

Next, we'll overclock your graphics card's RAM. All you have to do is run the Heaven benchmark in a window, and gradually start increasing the memory clock setting until you see glitches or visual artifacts in the benchmark. Increase the memory clock in increments of 5-10MHz. If you go too high too fast you might crash the system (though it will be fine after a reset).

STEP 3 GPU

After you've found the sweet spot for your memory clock, set it back to default and shift your focus to the core clock. Again, up the clockspeed in small increments, until the Heaven benchmark starts to show the strain. The telltale visual artifacts can take a number of forms, including colored blobs, full-screen flashes or stray pixels. When they start to appear, dial the GPU clock back until the benchmark is once again stable. Also keep an eye on the temperature of your graphics card. Even if no visual artifacts appear, you'll want to keep the average GPU temperature below 80 C, or you'll wear your expensive chip out much faster.

STEP 4 ENSURE IT'S STABLE

Once you've found the ideal overclock for both the video memory and the GPU, you're ready to activate both at the same time and run the benchmark in full screen again. There's a good chance that with both active you'll see new artefacts or your PC will crash. If that happens, just tweak both overclocks down by a small increment and keep trying to run the tests.

Even if your benchmark is stable for now, there's a chance it will overheat during longer sessions. We recommend you loop the Heaven benchmark for 15-20 minutes to make sure that this isn't the case.

MEMORY OVERCLOCKING

Is it worth it?

It's possible to overclock your memory if you have the right hardware, but it's much less commonly done than CPU or GPU overclocking. So, should you overclock your RAM? In our opinion, no.

The reason we don't recommend overclocking RAM is a simple cost-benefit analysis. The cost, like with any overclock, is in stability. Especially with an aggressive overclock, you run the risk of wearing your part out prematurely, or of making it unstable and causing system crashes. The GPU can recover from a glitch without crashing the whole system, but not your RAM. Also, because RAM overclocking isn't quite as common, there are fewer resources available to help you.

On the flip side, the benefits to overclocking your RAM just aren't very substantial. Overclocked RAM has faster throughput, but memory throughput is almost never a bottleneck, and will have a negligible effect on gaming performance. The risks of overclocking memory aren't huge, but there's just not much reason to do it.

46 Open the Users folder from Run With the Run dialog open, enter two periods then press Enter to open your Users folder. 47 and press the left or right arrow keys. 48 Lock in a hurry Throw up the windows lock screen immediately by pressing WIN

MORE HARDWARE TWEAKS

Five more ways to get your PC back to its speedy best

32 DEFRAG HDDS

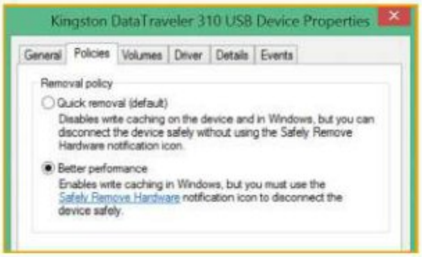
One of the oldest computer tricks in the book, defragging your hard drive isn't quite the performance booster it used to be. For one, more and more computers now come with SSDs, which do not benefit from defragging. Also, Windows 7 and 8 defragment on an automatic schedule, so it's unlikely your drives are fragmented if you use one of those systems. On older versions of Windows, fragmentation can still slow your hard drives down, so it's worth running a disk defragmentation program, such as the built in Windows Dfrg.msc or the free Defraggler (www.piriform.com/defraggler).

Optimize Drives
Status
Drive
Media type
Last run
Current status
Analyze
Optimize

TRIM helps SSDs stay fast, even once they start filling up.

33 KEEP IT TRIM

SSDs don't need to be defragged, but there is one optimization that can make a big difference, called TRIM support. TRIM prevents an SSD from slowing down as it gets filled with data, and increases its expected life span.



Kingston DataTraveler 310 USB Device Properties

Removal policy

○ Quick removal (default)
Disables write caching on the device and in Windows, but you can disconnect the device safely without using the Safely Remove Hardware notification icon.

● Better performance
Enables write caching in Windows, but you must use the Safely Remove Hardware notification icon to disconnect the device safely.

You can speed up your USB drive, as long as you remember to safely remove it.

The good (or bad) news is that Windows 7 and 8 automatically enable TRIM for SSDs, so you won't be able to get a speed boost there. However, if you're running Windows XP or Vista, it's definitely worth enabling it. To do this, you'll have to use the third-party management software available from the manufacturer of your SSD.

34 CLEAN OUT FANS

Not every problem that slows your PC is a high-tech one. Old-fashioned dirt and dust can build up, blocking fans and vents. It may seem trivial, but a jammed vent can cause your PC to overheat and chug. Airflow obstructions are especially likely in homes with hairy pets. In the worst cases, high heat will cause your components to degrade faster. Get in there with a can of compressed air and make sure nothing's blocking your vents, fans or the fins of your CPU cooler.

35 ADJUST USB STORAGE FOR BETTER PERFORMANCE

If you have an external USB drive you frequently transfer data to or from, you can get a small speed boost by disabling write caching on the drive. The drawback is that write caching protects USB drives from data loss if they're removed in the midst of a transfer. If you're willing to make sure to press the "safely remove drive" button every time, you can improve performance by opening the Device Manager, navigating to the drive, then right-clicking it and opening the Properties menu. In the Policies tab, click "Better Performance."

36 RUN A SMART TEST

Hard drive failure is one of the most alarming things. Even with a back-up strategy (which you have, right?) the temporary loss of your data is a major inconvenience. Save yourself some time down the line by running a SMART test on your hard drive—a process that will help you identify soon-to-fail drives. Just download a free SMART diagnostic tool like CrystalDiskCheck (http://bit.ly/TKZ1VK), and run it to test your drive. If the drive fails any of the tests, it's time to get a new one.

ALL IS LOST When to admit defeat

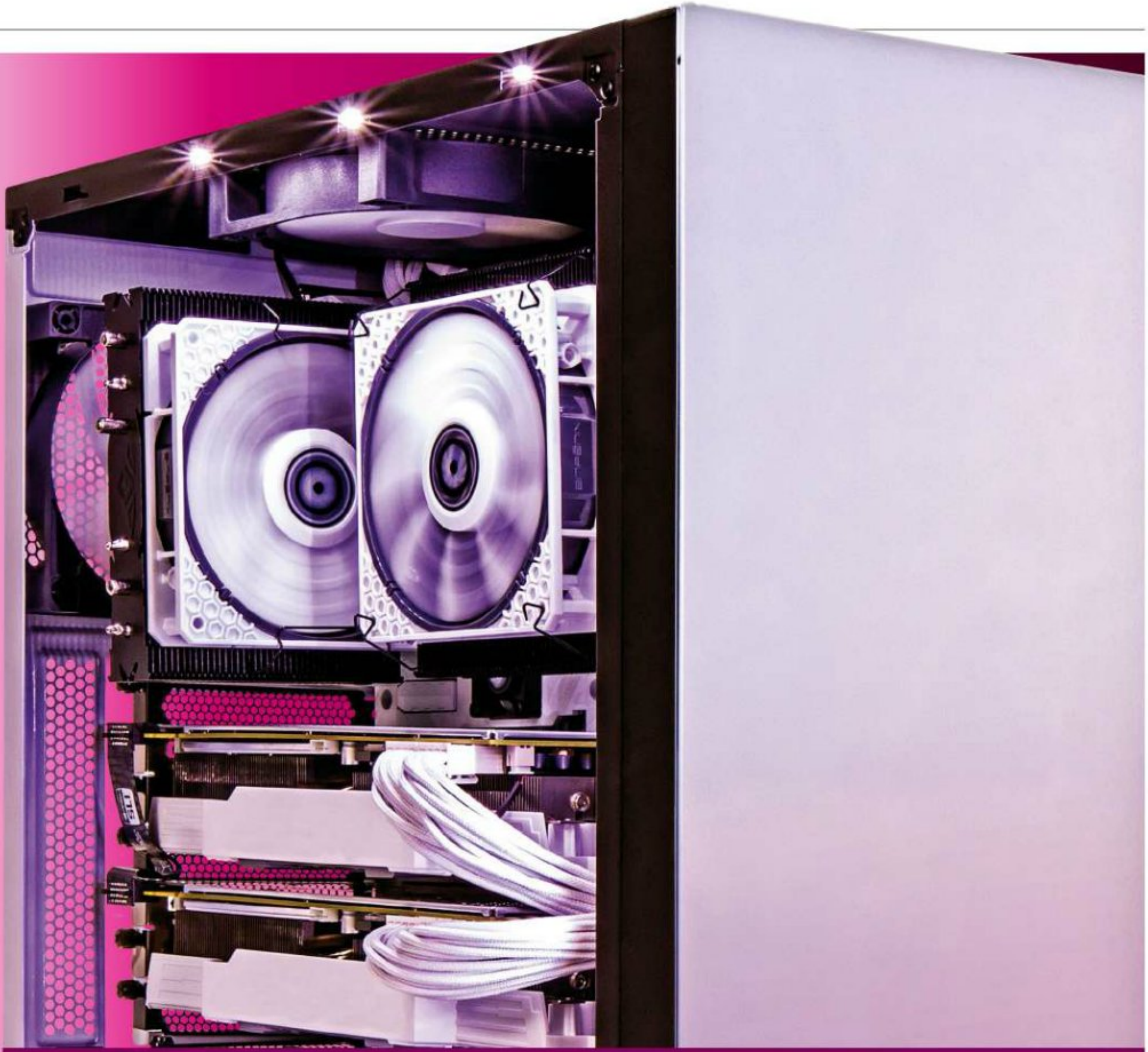
So far in this article, we've taken the generally optimistic stance that every computer can be sped up with nothing more than a little bit of elbow grease. And while it's true that it's very hard to mess up your PC so badly you can't fix it, it's not impossible. It's easier still to get into a situation where repairing the damage is going to be more work than just starting fresh, and knowing when this is the case will save you a lot of time. Here are our standards for when to throw in the towel.

A bad virus infection: A lot of malware can be easily removed using a tool such as Malwarebyte Anti-Malware, but sometimes an infection is just too bad to fix. Don't worry, you'll know it when you run into a PC like this—the Malware scanner will have a red flag list that's hundreds of items long, and includes viruses and other more malicious software. You don't want to risk clearing out most of the malware while probably leaving only the most sophisticated and dastardly to carry on running in secret.

When upgrading to a new version of Windows: When you're ready to move on to the latest, greatest version of Windows, it's worth doing a clean install. Microsoft gives you the option to do an "in-place" install, keeping your files intact, but in our experience it's not worth it. Follow proper backup procedures and start over with a nice, clean Windows installation. You won't have to worry about any complications from the in-place upgrade, and it will give you an opportunity to re-evaluate which programs you really need installed.

A Windows XP computer: We know, some of you still love Windows XP very much, but it's simply time to upgrade to a more modern OS. It's not worth trying to speed up a Windows XP PC, because even if you get it to like-new condition, you'll still have a computer that's not secure.

+ L. *49* Cycle with the keyboard You can cycle through options in any menu by pressing the Tab key to cycle forward, and Windows key, then start typing. *51* Recover lost tabs Didn't mean to close a browser tab? Press Ctrl + Shift + T to get the most



THE FINAL WORD

Stay lean, get mean, and keep it clean

If you've made it through all the tips in this article, you've probably noticed that none of the steps individually are that big or difficult. Instead, what it really comes down to is cultivating a set of habits that keep your PC organized and efficient. To try and contextualize it a little more, here's a big picture look at how to keep your PC running as fast as it can.

On the hardware level, basic maintenance is all you really need. There are a few tweaks to be made, but as long as you keep your system physically clean and occasionally run a test to check the integrity of your hard drives, you'll be fine. You can get a significant speed boost by overclocking your hardware, but only if it's a good component to begin with.

There are lots of ways to improve your system at the OS and software level, but they basically boil down to a few central principles. For one, try and keep things lean. The more software you install, the more things start up with your PC. The fuller your hard drives are, the slower your computer's going to run. Don't stress about every little thing you install, but if you can delete a few programs every now and then your computer will be better off. Similarly, consider replacing some of your more heavy-duty programs with lightweight ones, if you don't need all the features of the former.

Finally, you have to acknowledge that sometimes the best thing you can do is to just start fresh. We described when you should reinstall, the best way to do it, and even how you can start again with a whole new operating system. Hopefully your computer isn't at that stage yet, and you'll be able to put some of the tips from the last 10 pages to good use.

Shift + Tab to go back. *50* **Search Windows 8 immediately** The fastest way to search for something in Windows 8 is to press the recently closed tab back. *52* **Quick zoom** Zoom on webpages or documents by holding Control and scrolling the mouse wheel.

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Competitive gaming has broken out of bedrooms and into arenas – and 2015 will be its biggest year yet

BY HENRY WINCHESTER

Picture the world some 20 years from now: no flying cars, no space travel, no robots. And no people living in abandoned Moscow Metro stations. The one thing that's changed is that eSports has become massive. The first dedicated eSports stadium, the AMDNvidia Arena, opened in 2025. Built in the middle of the Pacific Ocean, exactly halfway between South Korea and North America, it's the single biggest stadium on the planet, so large it has its own airport, currency, and nationality, and it's guarded by fearsome genetically modified sharks.

The eSports phenomenon has eclipsed all other sports. VR bars fill with fans wearing the latest generation of Oculus Facebook Rift headsets, which squirt neat alcohol into attendees' eyeballs so they don't miss a single click. Giant screens on Times Square broadcast the latest *League of Dota* and *Counter-StarCraft* games to the baying masses. The surface of the Moon is appropriated to advertise the R.A.T. 94, the first mouse with a dedicated zero-gravity setting.

The seeds of this future have already been sown. Esports is as old as gaming itself, but recent elements—Twitch, free-to-play games, and massive investments—have come together to make it more popular than ever before. If 2013 saw large rises in terms of audience and participation, then 2014 saw it grow beyond anyone's wildest dreams. But as a genre and format it's still on the brink of accessibility by mainstream audiences, something which will change in 2015.

Here we look at how we've got this far, what the scene is like, and the challenges it still faces. Everyone we've spoken to is hugely enthusiastic about the future—almost to the extent that we can begin laying the foundations of the stadium-island. We won't bother with the genetically modified sharks... that would just be silly.

eSPORTS COMES OF AGE

Poland will run out of room for these events soon.

Nestled in the 7th December 1972 issue of *Rolling Stone*, between features on Carlos Santana and the Hippie Mafia, is a piece on Stanford University's Spacewar competition. This proto-gaming event had, in fact, already gathered the elements that would shape eSports. It had mainstream coverage. There was a prize: a subscription to the magazine. But, most importantly, there was a group of young people who wanted to prove they were the best at a certain game, that they could become the college athletes who could think their way to victory.

From this early exposure the idea of gaming tournaments grew at the same rate as games themselves. A *Space Invaders* Championship held by Atari in 1980 attracted 10,000 participants across the United States. The US National Video Game Team was established in 1983. Players, games, and tournaments were featured in the mainstream media: TV gameshow *Starcade* was broadcast; *Life* and *Time* magazines published features on these strange new gatherings of gamers; and the movie *The Wizard* had children in a *Super Mario Bros. 3* tournament.

These events were a wonderful thing for all the companies involved. People would turn out in their droves to see the Nintendo or Atari competition, to grab the freebies, to watch the champions reign supreme—and, of course, to buy the consoles so they could join and potentially beat these local heroes.

ESL's commentators provide in-depth analysis and fart gags.

ABOVE: **The crowd goes wild in New York.**

RIGHT: **If you can't compete, you can always cosplay. This also applies to job interviews.**

If there was a problem, it was that gamers could only practice head-to-head against one another, and being able to beat a handful of friends was an entirely different proposition to being able to take on the gaming champs of a whole city, who at the time had ripped gloves and mohicans, just in case you didn't know that they were total badasses.

Fortunately in the late '80s someone invented the Internet and made everything better. *Netrek*, which is still played to this day, was the third game ever released to be played online, and the first with team battles. In 1993 *Doom* brought LAN and modem-based multiplayer battles, coining the term "deathmatch" and introducing online gaming to a larger audience. The multiplayer element of *Doom* proved to be so incredibly successful that almost every shooter that followed felt the need to incorporate some form of online competition.

Gaming tournaments throughout the '90s tended to be dominated by beat-'em-ups, which neatly balanced players' skill with visceral, gratifying action which could be easily understood by any audience. But the

IN IT TO WIN IT

Want to make money just by playing games? You'll need to know which to play

Last year a massive amount of prize money was divvied up among the world's most talented gamers. Sure, it's a long way from the many millions of dollars that professional sportspeople are paid, but there's still enough for a sizable number of gamers to make a living simply from playing games. Master these titles and you might just become quite well-off... or you could at least bag a T-shirt and some RAM.

At over $10 million, Valve's arena strategy title *Dota 2* has by far the biggest prize fund available in any game. This kitty is funded in a unique way: every time someone buys a $10 virtual copy of *Dota 2*'s guidebook *The Compendium*, $2.50 of that cash goes into the pot. The first $1.6 million came from Valve itself, but the rest has been generated by somewhere around 3.3 million sales of the booklet.

Dota 2's bigger prize fund doesn't mean you have a better chance of claiming your stake, though. To date it's had 665 players gaming across 278 tournaments. *League of Legends* has a prize fund of 'just' $2 million, but with 2,411 players across 1,110 tournaments it's a far less exclusive affair than Valve's genre stablemate.

The game's developer, Riot, has no plans to increase the fund, instead reinvesting money in the title's infrastructure so it remains attractive to free-to-play gamers. It's a smart move. After all, will *Dota 2* fans really want to keep buying *The Compendium* forever?

Lower down the rankings sit a fairly random assortment of games, with *StarCraft II* and its expansion *Brood War* rubbing shoulders with 2002's *WarCraft III*, 2004's *Painkiller* and 1999's *Counter-Strike*.

In terms of earnings, 14 of the top 20 in the world have amassed their riches from *Dota 2*, and nine of those players are Chinese. So, go *Dota 2* if you're generally quite lucky in gaming terms, and opt for a few quick bouts of *League of Legends* if you're generally not.

Internet was giving bedroom gamers a chance to hone their skills on fast-paced first-person shooters and complex real time strategy games in a way that wasn't possible before. One minute they could be playing their friend down the street, the next they could be up against Australia's national champion.

Tournaments soon sprang up, and by the early 2000s they were seeping off the Internet and breaking into the real world. Ever ahead of the game, South Korea hosted the first gaming tournament as we know it today. The World Cyber Games, in 2000, included players from 17 countries fighting to the bitter end in games as varied as *Starcraft: Brood War*, *Quake III Arena*, *FIFA 2000*, and *Age of Empires II*. The US's Major League Gaming followed in 2002, while the Germany-based Electronic Sports League's first Intel Extreme Masters tournament took place in 2006.

While these events have expanded considerably over the past decade or so, there's been a piece of the puzzle missing until fairly recently. Esports leagues typically broadcast the tournaments via their own platforms or media channels, resulting in fragmentation for fans of the various events. Twitch, founded in 2011 as a spin-off of livestreaming site Justin TV, has provided a go-to platform for gamers to watch live games. It's proved that gamers are every bit as interested in watching matches as they are in playing them.

With Twitch in place, eSports has become a fundamental part of popular culture. Indeed 2013 was epic, with 44 million hours of ESL's games watched via Twitch, and $2.5 million total prize money handed out. But 2014 has pushed the boat out even further, with the first gamers becoming bona fide millionaires just through doing something they love. And in 2015 the interactive sports snowball will become so incredibly massive that you could film a remake of *The Empire Strikes Back* on it.

LEAGUES AHEAD

"It's really insane," says James Lampkin, the Electronic Sports League's Canadian-born senior manager. "We've run events in Poland a few years in a row—the first year there were probably five or six thousand people there, the year after it's closer to 10, and last year there were 14,000 people. It's funny because now when we run an event that has 5,000 people everyone goes, 'Oh, y'know, it's only 5,000 people.'"

According to Lampkin, the factors behind this recent explosive growth boil down to the enormous success of Twitch TV combined with the straightforward accessibility of free-to-play games. The latter have blossomed recently, going from dodgily implemented MMOs to fast-paced MOBA games—such as *League of Legends* and *Dota* —as well as polished genre efforts such as *World of Tanks* and *Hearthstone: Heroes of WarCraft*.

Free-to-play works really well in eSports because it's all about subtly increasing the challenge for players—you can either work your way around a barrier, or pay to get to

COMMENTARY IS FREE

ESL commentator Alex Richardson talks about the vital link between in-game action and the audience

What's your background, and how did you get into commentating for games?

I've been commentating on games since I was 17, so for about four years. I came across SHOUTcasting via QuadV, where Deman, Joe, Redeye, and TosspoT were casting *Call of Duty 4*, the first game I took a competitive interest in. I enjoyed listening but also said to myself, "Hey, I can do that!" I started doing so for fun, and a series of small opportunities led to my growth as a commentator, which eventually ended with me working for ESL.

How do you keep a track of what's going on in all the various games?

In shooters I tend to just focus on what an individual is doing and what their actions can influence, be it opening a bomb site or closing out the first map, perhaps coupled with a wider overview. In MOBAs I'm keeping track of 10 players at any given time. It's a bit of an adjustment and I'm still learning—thankfully from some of the best.

What do you think are the most important qualities a commentator should have?

A good voice is definitely part of it, but most important is the ability to combine what you're saying—which has to be factually correct and interesting—with good inflection, while not getting ahead of yourself or too caught up in the moment. That's a place where the best commentators are born.

How do you see the eSports scene changing in 2015?

This year is going to be interesting. It will have been about enough time for game publishers and eSports organizers to recognize the success eSports games are enjoying and perhaps try and mirror them or follow their tournament design structure. I think eSports is starting to hit the mainstream, which is awesome, and I can only see that increasing as time goes on. People love games and people love competition—combined with the team-support aspect, we're in for a winner!

the top. But almost all of these games have their roots in more traditional, even single-player, models.

"The most important things in an eSports title are watchability and how good the game actually is—that's the core fundamentals," says Lampkin. "Before you can have a good eSport you have to have a really good game. What we see with the most successful titles is that they're really easy to get into, and really hard to become exceptionally good at. The skills ceiling is really high."

The biggest games for the ESL are currently *League of Legends*, *Counter-Strike* and *Dota 2*, but the popularity of games often rotates on a yearly basis. "In 2010, *StarCraft II* was by far the biggest game, even into 2011," says Lampkin. "Once *League of Legends* picked up popularity, *StarCraft* viewership stabilized and flattened out, whereas *League of Legends* just went on this massive growth curve. *Counter-Strike* and *Dota* have been following that same trend, because they're free to play and very accessible."

The biggest curveball eSports has been thrown recently has been *Hearthstone*, *World of WarCraft* developer Blizzard's card-based venture into free-to-play gaming. "It's really interesting because it's a card game, which is not traditional in the eSports arena—it's not a shooter," says Lampkin. "But the viewership on that is actually really high, and there's a very low barrier to entry, which is easier to get into."

ABOVE: **Ninjas in Pyjamas scoop a prize in Cologne.**

RIGHT: **ESL One's *Dota 2* competition hits New York.**

WE NEED HEROES

Just like more conventional sports, eSports are all about icons and heroes. Jang Min Chul may be pretty much unknown outside the world of South Korean eSports, but within the *StarCraft II* leagues he's every bit as worshipped as John Madden or LeBron James. It's a desire to emulate champions such as Jang that leads to the exponential growth of eSports audiences.

"We look at this in the same way you'd look at football," says Lampkin. "Everybody understands the idea, but when you see a player do an insane goal from halfway across the pitch you have this ability to form a relationship between your play and how good this person is."

As the eSports audience grows it becomes more interesting, too. Gaming is predominantly aimed at the 18 to 34 male demographic, which has high levels of disposable income, but at the same time is traditionally very fickle when it comes to marketing. In the past, gaming competitions would have been daubed with banners for

THE MAP AND THE TERRITORY

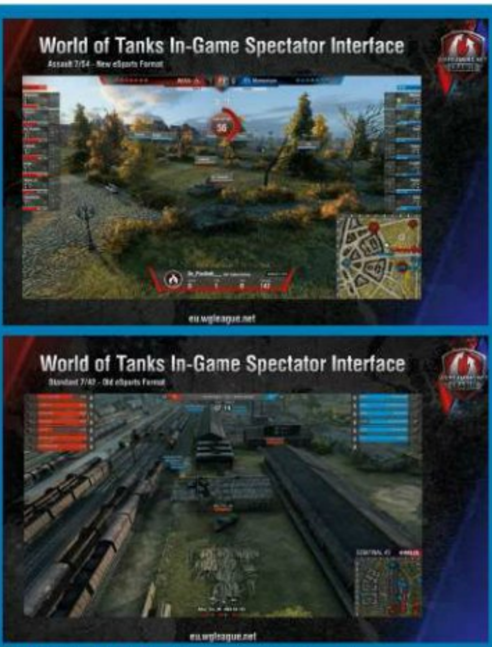
How World of Tanks upped its game for eSports

Esports requires a completely different approach to games which have come before. First launched as a free-to-play MMO in 2011, Wargaming's *World of Tanks* debuted on the eSports scene at the World Cyber Games in 2012. Since then it's been rebuilt to move it further away from its origins and towards something more frenetic and suited to the fast-paced world of eSports.

Update 9.4, introduced in November of last year, brought with it Attack/Defence mode, which is specifically tailored to tournaments. While the original game featured 10-minute matches, Attack/Defence brings the time down to seven minutes, with those missing three minutes adding a palpable air of tension. As the name suggests, one team attacks while the other defends, rather than the free-for-alls that defined earlier games.

As well as rebalancing the team structures in terms of combined tank tiers, Attack/Defence also required Wargaming to rethink its maps. In a standard battle, Himmelsdorf, for instance, included two bases to the north and south. For Attack/Defence mode this is completely rebalanced, with the defending team given a spawn point to the northwest, and two bases to defend to the north and west. The attacking team, meanwhile, is positioned to the southeast. It's a similar asymmetrical layout to multiplayer online battle arena games such as *League of Legends* and *Dota 2*, and one which creates natural pinch points and prevents players from camping out.

Closing the loop is a complete redesign of the spectator interface, to make the game more watchable. Gone are the unreadable stat bars and dull layout, replaced with big numbers and at-a-glance tables. The result is a game that's more accessible, more cinematic and pounding, but one which retains its inherent tankiness.


World of Tanks In-Game Spectator Interface
Assault 7/54 - New eSports Format
56
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World of Tanks In-Game Spectator Interface
Standard 7/42 - Old eSports Format
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TOP: *World of Tanks* was redesigned to make it more spectator-friendly. BOTTOM: The old interface was deemed not at-a-glance enough.

ABOVE: Intel Extreme Masters returns to Katowice in 2015 for its biggest tournament yet.

OCZ or Creative or SteelSeries—brands largely unknown outside the pages of magazines such as this one. The massive increase in audience has brought with it lucrative sponsorship opportunities.

"The interesting part for us is that, as the scene is exploding so much, we're starting to get a lot of attention in the non-endemic world, so you're seeing lifestyle brands like Red Bull and Gillette," says Lampkin. "Pizza Hut and T-Mobile sponsored one of our events in the US in October. We're beginning to see the whole world open up—these really big brands that say, 'How do we get in touch with this young group of males who are very hard to reach traditionally, and are moving away from television?'"

With such incredible audience growth and acceptance by mainstream brands, the inevitable question is exactly when will we be able to go to a sports bar on a Saturday afternoon and catch the big *League of Legends* or *Counter-Strike* match alongside viewers who would traditionally enjoy football. However, Lampkin believes that this is the wrong audience to pursue—and it's not for want of trying.

"A big question maybe four or five years ago was, how do we package it and twist it a bit so that the mainstream audience can enjoy it?" says Lampkin. "What we figured out at the time was that it was the wrong way to look at the problem. It was more about how we grow the scene rather than how we go after a group of people who just may not have been interested in it in the first place. It's more about how we get people who are in the gaming sphere who may just be casual gamers. We think there's a really large audience who aren't actively engaged yet, and that's the next step of growth for us."

Nevertheless, some mainstream media is gradually becoming more interested in covering eSports, with *CNN* and *The New York Times* both carrying headlines on events in the last year. "A few years ago we'd talk to the odd press outlet in the mainstream press, where the questions would be, 'What is this? We don't really understand it and we're not sure if we want to understand it,'" says Lampkin. "Now there are a lot of mainstream outlets coming to us and saying, 'This is a phenomenon, we don't get it, please explain it to us because we want to be involved.'"

FUTURE SHOCK

Everything is in place to make 2015 the biggest year for eSports yet. Sponsorship deals will likely explode the budget that eSports events have, mainstream press coverage will increase its acceptance as a worthy alternative to established sports, and there will be enough variety in the games to ensure there's something for everyone. The biggest game of 2015? *Counter-Strike*, says Lampkin.

"Each event that *Counter-Strike* has seen over the past year and a half has been these one-off events, where you have a bunch of the big popular teams—and every three or four months they have these events, and the viewership just grows and grows and grows," he says. "When it first came out, a lot of people were really skeptical about whether it'll do well, and it sort of stalled a little bit at the start, but due to the work Valve has put into the game it's started picking up momentum, which is very rare for a game release."

As for the events themselves, Lampkin and the ESL have grand plans. In March they'll return to Katowice in Poland for the World Masters portion of Intel Extreme Masters, for the first time using two venues side by side. The long-term vision for ESL isn't just about packing lots of people into a sea-stadium—it's about doing it frequently.

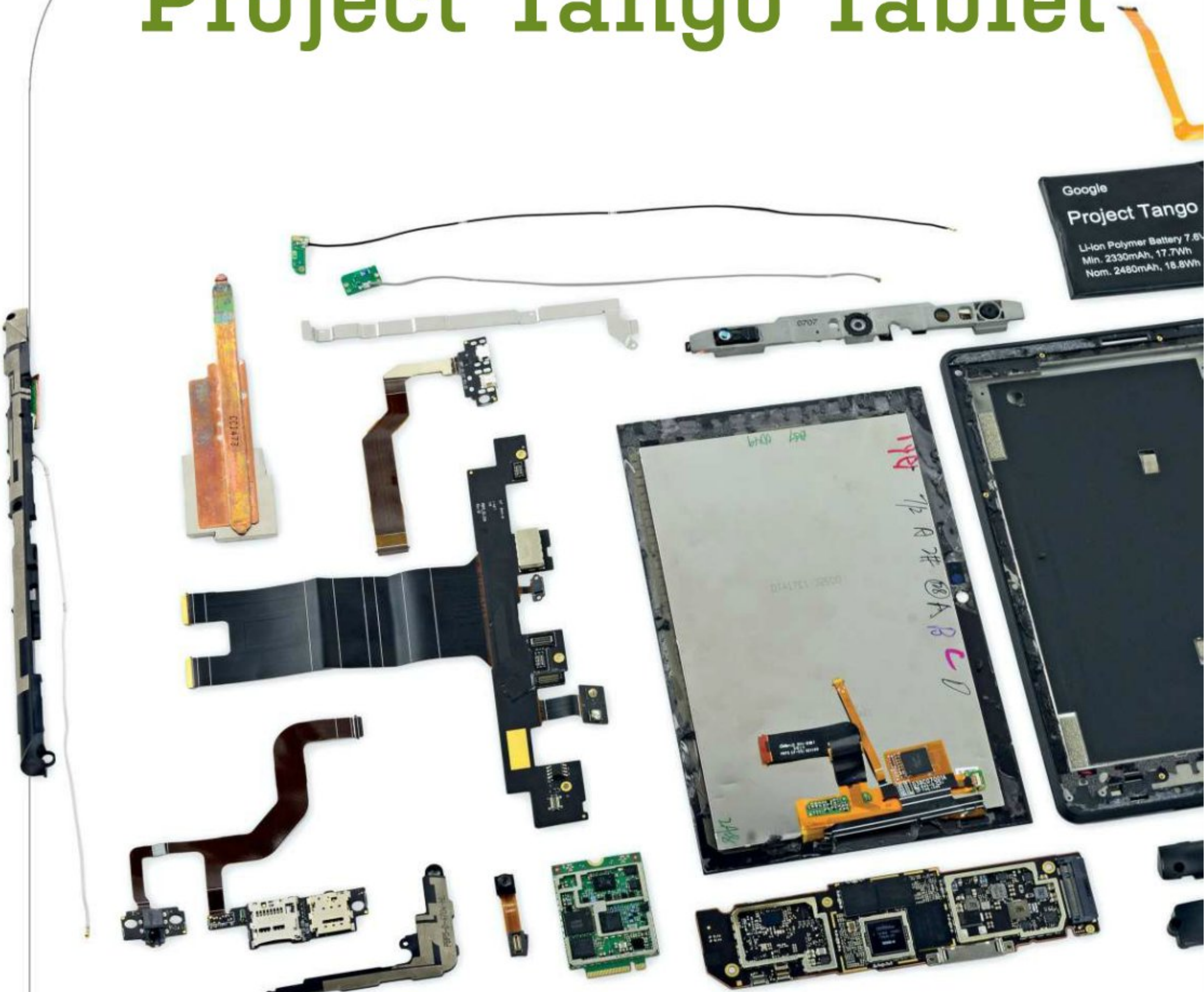
"The real question going forward for us isn't 'Can you put people into a stadium?', because I think we've answered that," says Lampkin. "It's how often can you put people into a stadium. We're doing it five or six weekends per year, but the real growth is how you do it over and over again in all these different regions. Mainstream sport is doing it 25, maybe 30 weekends per year." ⏻

IFIXIT presents:

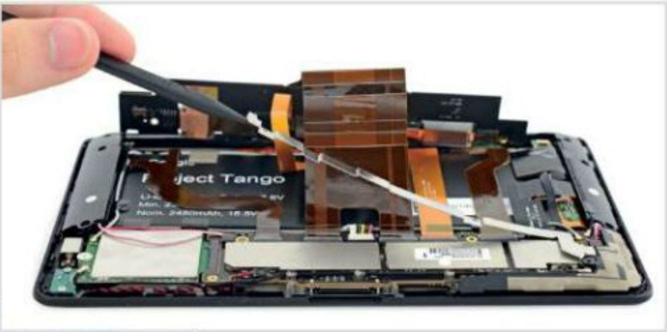
AUTOPSY

THIS MONTH WE DISSECT...

Project Tango Tablet


Google
Project Tango
Li-ion Polymer Battery 7.6V
Min. 2330mAh, 17.7Wh
Nom. 2480mAh, 18.8Wh

There's a lot of hardware in the Project Tango tablet, but this is a top secret prototype, so you'd expect some redundancy.



Several connectors and ribbon cables need to be removed before you can ease the double battery pack out of the way.

About iFixit

iFixit is a global community of tinkerers dedicated to helping people fix things through free online repair manuals and teardowns. iFixit believes that everyone has the right to maintain and repair their own products. To learn more, visit www.ifixit.com.

BACKGROUND:

This looks like just another tablet, but peer behind the specs and you'll find something very cool indeed. An Android-based dev kit, Project Tango is designed by Google's Advanced Technology and Projects division to make 3D maps of your environment so that you can integrate that environment into your apps. Think augmented reality on steroids. It started as a phone-sized kit, but now has a much beefier spec.

MAJOR TECH SPECS:

- 7-inch HD 1920x1200 (323 ppi) touchscreen display
- 120-degree front-facing camera + 4MP RGB-IR rear-facing camera along with a 170-degree motion-tracking camera
- 2.3GHz quad-core Nvidia Tegra K1 CPU
- 4GB RAM
- 128GB flash memory, expandable via microSD

KEY FINDINGS:

- The rear is home to half a dozen numeric identifiers, an Nvidia logo, and a disclaimer that it's not FCC authorized—it isn't designed to make it into the hands of the masses. Buried beneath is the model number: NX-74751, which just so happens to be the registry number of the USS *Yellowstone* from *Star Trek: Voyager*. We should've known Google loves a good *Star Trek* reference.
- Riddle us this: How many screws does it take to secure the rear case to the front panel? Zero. There's no adhesive either. You can get inside with a plastic opening tool, revealing all those promised goodies. Be careful though, the camera array is mounted on a board attached to the rear case.
- Pull out a few screws and the camera board comes free. The back cover is full of holes for that vast array of cameras, and covered in antennas—including NFC.
- The Mantis Vision IR projector is tucked within the camera assembly. This is fundamental because it provides IR light that other (non-RGB) cameras can use to get a sense of an area in 3D space. It's custom designed to work in partnership with the 4MP RGB-IR camera on the other side.
- Mapping a space in 3D requires a hefty source of power. Luckily the Project Tango tablet has just that. The battery is custom designed to be dual cell for max power drawn when necessary. A bit of light adhesive is all that anchors it to the front panel assembly. The dual-cell 7.6 V Li-ion polymer battery is rated at around 18Wh of energy. For comparison, the Nexus 7 Second Generation has a 15Wh battery.
- Repairability Score: 4 out of 10 (10 is easiest to repair). The rear case is super easy to open. Several cables cover the battery and make it a pain to remove—but you don't need to melt adhesive. Low modularity—several parts soldered to the same components makes replacement parts expensive. This thing is full of cables and not at all fun to disassemble.

We've upgraded

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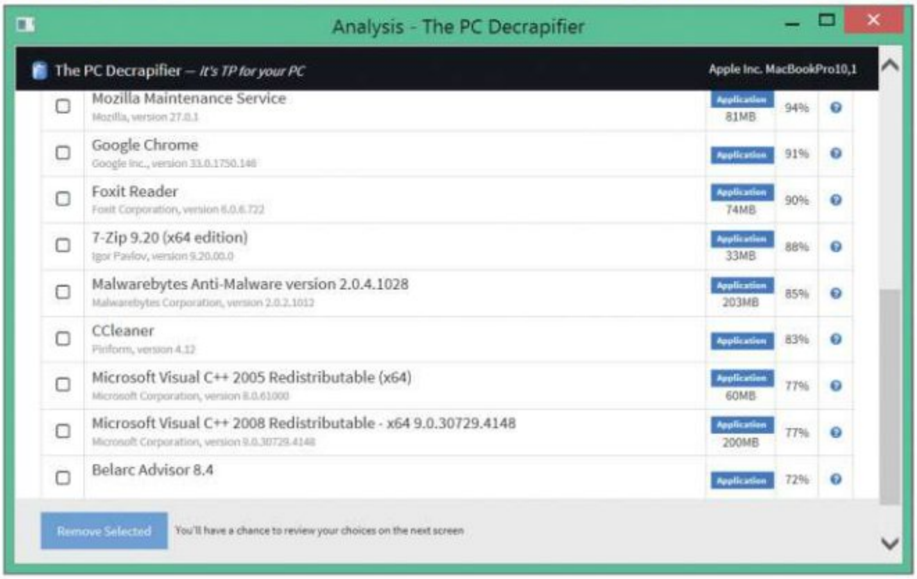
HOW TO

STEP-BY-STEP GUIDES TO IMPROVING YOUR PC

WINDOWS TIP OF THE MONTH



Analysis - The PC Decrapifier

The PC Decrapifier — *It's TP for your PC*	Apple Inc. MacBookPro10,1

☐	Mozilla Maintenance Service Mozilla, version 27.0.1	Application 81MB	94%	?
☐	Google Chrome Google Inc., version 33.0.1750.146	Application	91%	?
☐	Foxit Reader Foxit Corporation, version 6.0.6.722	Application 74MB	90%	?
☐	7-Zip 9.20 (x64 edition) Igor Pavlov, version 9.20.00.0	Application 33MB	88%	?
☐	Malwarebytes Anti-Malware version 2.0.4.1028 Malwarebytes Corporation, version 2.0.2.1012	Application 203MB	85%	?
☐	CCleaner Piriform, version 4.12	Application	83%	?
☐	Microsoft Visual C++ 2005 Redistributable (x64) Microsoft Corporation, version 8.0.61000	Application 60MB	77%	?
☐	Microsoft Visual C++ 2008 Redistributable - x64 9.0.30729.4148 Microsoft Corporation, version 9.0.30729.4148	Application 200MB	77%	?
☐	Belarc Advisor 8.4	Application	72%	?

You'll have a chance to review your choices on the next screen

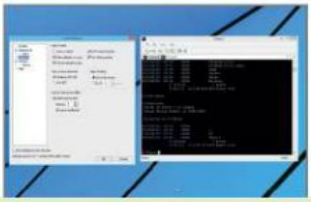
START ON THE RIGHT FOOT WITH PC DECRAPIFIER

New off-the-shelf computers and laptops usually come preloaded with a bunch of unwanted software. Save yourself some time and speed up your PC by running PC Decrapifier—it automatically finds tons of common bloatware, and lets you uninstall it with a single click. Get it at www.pcdecrapifier.com.

MAKE – USE – CREATE

League of Legends

60
Create top quality streams



63
Get Windows 10 features now

ALEX CASTLE
CONTRIBUTING EDITOR

WHERE ARE WE AT WITH TRUECRYPT?

Of all the many apps and utilities I've recommended, there are few that come up as much as TrueCrypt—the powerful, flexible encryption software. For security and privacy purposes it's always been my number one pick. Because of that, I've been in a bind since last May, when TrueCrypt suddenly declared the utility discontinued. Because I think encryption and security are so important, I decided to check in again on the alternatives.

First, you still have the option to continue using TrueCrypt. It's not officially supported, but no credible evidence has surfaced that the software has been cracked. Waiting for the promising CipherShed fork to come to fruition is a second option, but there's no publicly available version of the software yet.

That leaves VeraCrypt, which has become my new general-purpose recommendation for encryption. Forked before TrueCrypt was discontinued, VeraCrypt is an open-source tool that will feel very familiar to any TrueCrypt users. Find it at http://bit.ly/1phiEjS.

↘ submit your How To project idea to: comments@maximumpc.com

Create Top Quality Streams

YOU'LL NEED THIS

OPEN BROADCASTING SOFTWARE
A fantastic freeware tool. For now, use the 32-bit version.

A GOOD CONNECTION
Without one, you're best off sticking to Let's Play. Streams take a lot of bandwidth.

EVEN IF DOUBTS OVER THE SIZE OF STREAMING EXISTED, they vanished the moment Amazon spent almost a billion bucks on buying the biggest portal, Twitch.tv. At the time of writing, over 125,000 people are watching games of *Dota 2*, over 34,000 are sitting in on *Hearthstone* duels, and—proving it's not just the big games that draw an audience—almost 25,000 are watching others jump in *Five Nights at Freddy's*, an indie game about a tacky restaurant full of killer robots in animal suits. As ever, taking part isn't that hard.

Twitch is directly integrated in several games, including *Minecraft*, as well as both current-gen consoles. On Xbox One, you say "Xbox, broadcast," and you're done. But we use PCs, and we can do a hell of a lot better than that—provided we have a broadband connection capable of it. Whether you've got someone on hand to help or are going it alone with free or commercial tools, it's easy to make something very cool. –**RICHARD COBBETT**

1 GETTING STARTED

Unfortunately, home broadband connections are heavily asynchronous—your 50Mb/s download will likely have a single-figure upload speed. For full-resolution streaming, you're looking at around 10Mb/s and up. It's possible to downscale a bit, squeezing performance onto weaker connections, and most streamable games are fine with that. But it's also worth looking into an alternative to Wi-Fi if possible—ideally a direct Ethernet link or powerline networking.

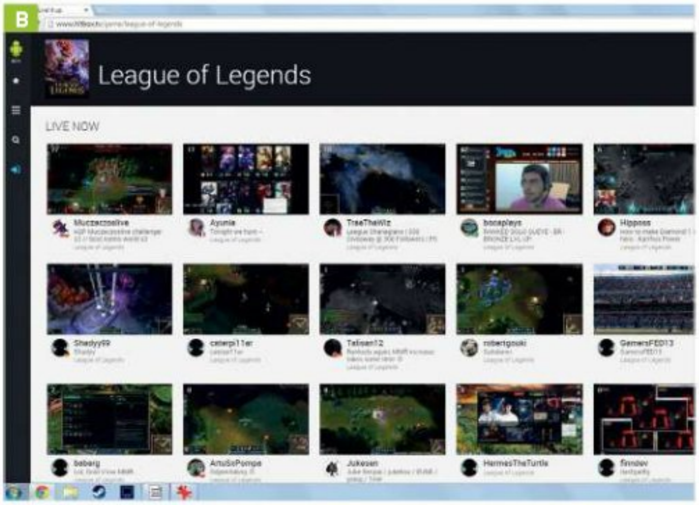
» On the streaming side, there's no shortage of options and it's possible to do everything for free. It's also possible to invest in all kinds of tools. A capture card such as the Elgato (**Image A**), for instance, might seem ridiculous given that you can record the screen without help, but its benefit is being able to shunt footage to a second PC that can handle things like integrating cameras, bringing in other people via Skype, and doing the grunt work without soaking up your main PC's processing power or forcing you to play the game in a window to still keep tabs on what other people are saying. Likewise, the software available ranges from free (OBS) to affordable (XSplit, $25 for three months) to "Woah!" (Livestream, $799).

» Thankfully the free option is also one of the best. Open Broadcaster Software (www.obsproject.com) isn't always the most stable program, but it'll provide just about everything you need. For example, as well as simply broadcasting video, you can prepare scenes (such as cards that will appear before your stream starts) and switch between them at a keystroke. At a more advanced level you can take complete control. If you've decided to stream a *Dota 2* match, you might create a frame for the whole game, but you can also bring your face onto screen when you want to talk. Or for something like a Let's Play, you can address the audience full-screen during the introduction, but then move yourself into a corner.

» Unlike some tools out there (particularly the free versions of ones with a commercial side), OBS isn't limited to specific hosts. It comes with presets for the most popular choices, which (in descending order) are Twitch, Hitbox, and YouTube, but any other service can provide connection details. It also offers very useful extras, including the ability to downscale your video, broadcast at lower quality, and take a local copy. Twitch used to have reliable archives, but its focus is increasingly on "highlights," with its audience primarily being interested in live shows, and Twitch capping highlight videos at two hours. As such, for online archiving, it's best to put a copy on YouTube.

A

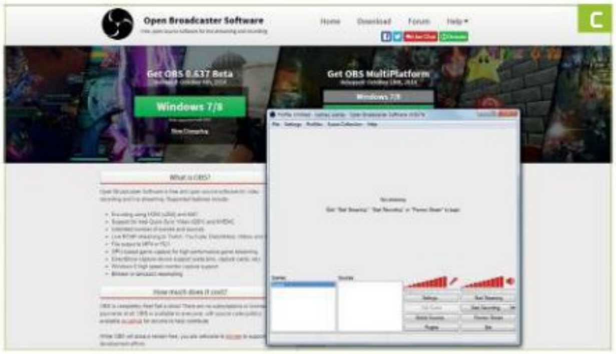
B

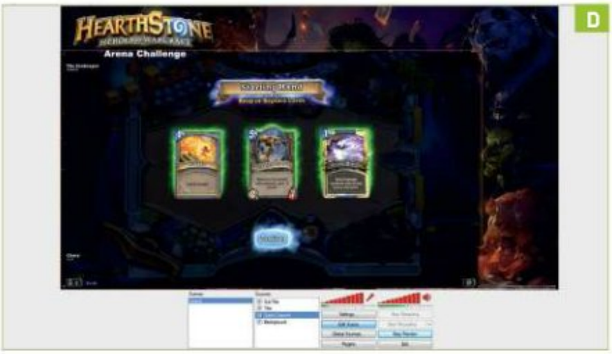


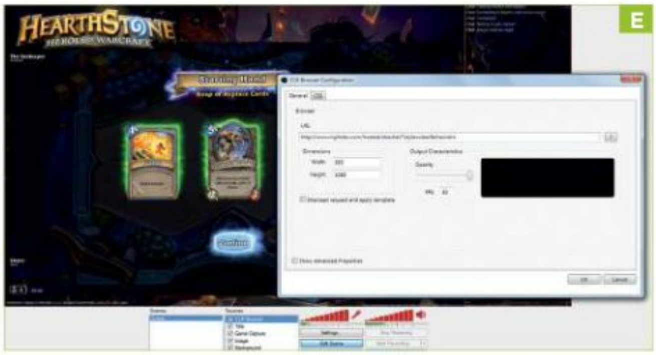
2 STREAMING HOSTS

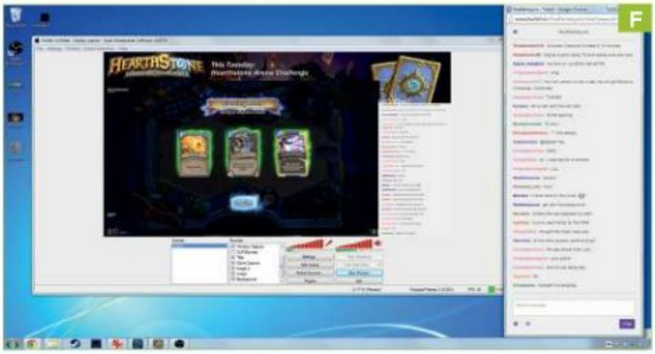
So, which site should you use for streaming and building an audience? The biggest by far is twitch.tv, though its size has had knock-on effects in terms of its reliability. The delays and chance of losing connection to chat are a real pain. If people are going to search for a game though, they'll do it here.

» Hitbox (**Image B**) is the up and coming alternative. It's smaller but cleaner, and tends to have better performance. If you're bringing an audience from elsewhere, like a YouTube channel, Hitbox is probably the one to use. If your YouTube account is in "good standing," you can activate this for your channel. It's really more for events though, and Content ID runs live on it, which can switch you off mid-flow. Use YouTube for storing streams, but stick with other services for making them.









3 CREATING AND DESIGNING YOUR STREAM

For an incredibly easy route to creating a good quality production, head to obsproject.com to download Open Broadcasting Software (OBS). Normally, you'd want the 64-bit version, but this time go with the 32-bit (**Image C**). This is because many of the plugins are only compatible with that version, plus you'll benefit from extra stability.

» Each OBS scene can contain any number of "sources," as well as elements like imported pictures and text. Game Capture is the most efficient way of bringing in game footage, though not always compatible (**Image D**). For older titles especially, Window Capture is often needed instead, or even a workaround like using a tool such as DXTory to snag the video and then passing it across to OBS to be streamed. To lay things out, click "Preview scene → Edit scene (**Image E**)." Right-click "Sources" to add things like an image or text. Select them and you can drag them around the screen. Resizing most items is as easy as dragging the corners, but this will only stretch some elements, such as chat windows. To give them more space, double-click to edit them directly.

» As well as Sources there are Global Sources. The difference is that Sources are instanced every time you load that scene, which can be a problem for something like a game video as you don't want it cutting every time. If you add your Game Capture source in Global Sources, OBS will keep on streaming it whether it's visible or not. You can still move it around, resize it, and everything else, without interruptions.

» It's a good idea to embed chat in your stream, but it's not the easiest thing to do (**Image F**). For Twitch and Hitbox, which use IRC, try www.nightdev.com/obschat instead of hooking in directly; Twitch's webchat isn't the most stable. These tools will spit out text in the colors, sizes, and positions you want.

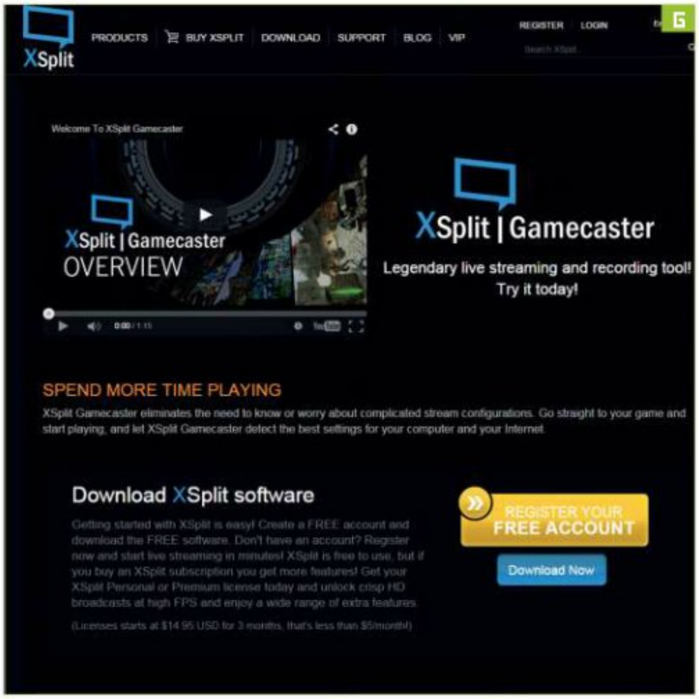
» If you're using something else, or want to import other web content, use Window Capture. Resize the active part of the screen as before. To crop it, hold down Shift when resizing and slice off everything but the part you need. You can put this wherever you like, but you won't have as much control over how it fits into your stream.

Let's play together
hitbox Partner Program
hitbox
Partner Features
Transcoding
Monetization
Subscriptions
Apply

The most popular streamers draw huge audiences. Between 10 and 100 is reasonable for normal folk.

MAKING MONEY: POSSIBLE, BUT NOT EASY

The main way to make money from streams (ignoring arrangements like promoting a product) is by partnering with your streaming provider. If you don't do this, it keeps all the cash from any ads. As a Twitch partner you get a share, plus the ability to time commercials to appear between games, and at high levels, the ability to offer subscriptions to viewers. The catch? You need an average concurrent viewership of 500-plus people and at least three regular broadcasts a week, or 100,000-plus subscribers if you're on YouTube or similar. Hitbox has a similar deal, with a lower base requirement of 100-plus people. Don't expect to be cashing any cheques just by streaming your *Dota 2* team... unless it includes Wil Wheaton, Felicia Day, and the Dark Lord Sauron running support.


G

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(Licenses starts at $14.95 USD for 3 months, that's less than $5/month!)

H

A decent HD webcam like Logitech's c920 should boost your image quality.

Logitech
Carl Zeiss Tessar HD 1080p

4 INVESTING IN STREAMING

If you find yourself hitting your limits, there's a few ways to break on through. For starters, if you feel OBS isn't working for you, XSplit ($24.95 for three months) is the first step on the commercial ladder (**Image G**). Renting instead of buying is a pain, but it offers a slicker, more stable experience. Its Gamecaster application also offers some handy features like the ability to scrawl on the screen to quickly make a point or highlight something.

» The next option is game capture gear. It's mostly aimed at consoles, but a dedicated unit can boost your PC's performance and enable you to do all of your broadcast setup and stream monitoring from a secondary machine. The Elgato Game Capture HD60 ($165) handles video at up to 1080p/60fps, though 30fps tends to be better for streaming right now.

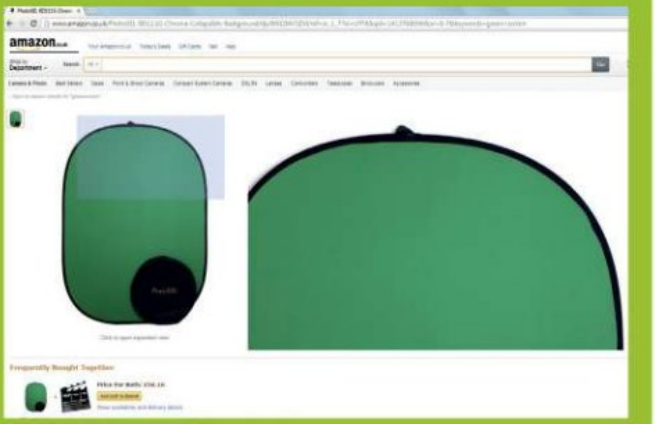
» Webcams have a bad reputation for picture quality, but often the reason for grainy images is low-light environments. Invest in a basic lighting rig and an HD camera like the Logitech c920 ($49) and you can get great quality (**Image H**). Bear in mind that even if you've got a well-lit room, standard fluorescents are no replacement for a good 5,500K bulb pointed exactly where it's needed.

» Another consideration is your microphone. You don't need a super-high quality microphone, but something more than a basic headset won't hurt. If you're willing to splash out on something decent, the Rode Podcaster ($205) is a great USB one with optional arm ($100) that's perfect for streaming, not least because it picks up almost no background noise. Some popular alternatives include the Blue Snowball (around $50) and the Blue Yeti ($100).

THE ART OF GREEN SCREEN

For starters, you'll need a screen. An ordinary bedsheet won't usually cut it due to being translucent. A basic opaque muslin sheet will cost about $30 and a basic stand to hang it from will add at least $40. Another option, which won't take as much tedious ironing, is a collapsible background such as the Photosel 1.5 x 2m background, which is around $100. Again, you'll need to prop it up or hang it from something. The big sheet is the best way to go though, offering far more space to play with when setting up your camera.

Next, lighting. Ideally you want one stand illuminating you and another flattening the light on your green screen. A pair of continuous lighting kit soft boxes to diffuse the light from one or more bulbs is ideal, and Amazon will sell you a pair for under $100. The single-bulb ones will be fine for a very small room, but you'll want a four-bulb model for anything larger. For that price they'll be rickety as heck, but should suffice. Light the screen first, then your own face to match it. If possible, open a window. All that light plus your PC means it'll get hot.



The software side is surprisingly easy—every streaming tool has a simple sliding bar to clip out the green background.

Get Windows 10 Features Now

YOU'LL NEED THIS

CLASSIC SHELL
Get a new custom Start menu (www.classicshell.net).

DEXPOT
Create four sets of virtual desktops. Download it for free at dexpot.de.

THE RELEASE OF WINDOWS 10 is still a good few months off, and if you're not quite brave enough to begin experimenting with the Technical Preview, you might be sighing in anticipation of all the new features that Windows 10 promises to bring to the desktop and elsewhere—not least the return of the Start menu.

Worry not though, because you can replicate many of those very same features in Windows 7 and 8 using a variety of (mostly free) third-party programs, as we'll demonstrate in this step-by-step guide. Some are quite well known—the amazing Classic Shell, for instance, has become a firm favorite among many Windows 8 users—but there are a few others you may not have known even existed. Once you discover them, you'll probably be hooked—and using them will get you ready to jump straight into Windows 10 when it lands later this year. **–ED RICKETTS**

1 GET CLASSIC SHELL

There are many utilities available to "fake" a Start menu in Win8, but the best is Classic Shell—and it's completely free (download it at www.classicshell.net). It consists of three components: Classic Start Menu, Classic Explorer, and Classic IE. If you just want the Start menu, ignore the other two.

2 START WITH STYLE

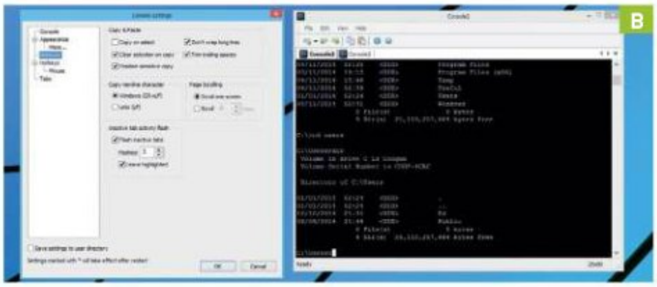
Once it's installed, click "Start" and you'll see the Settings screen. Choose which style of menu you'd like: "Classic style" is like Windows 95; "Classic with two columns" is like Windows Vista; and there's also "Windows 7 style." To go further, click "Show all settings." You can even replace the Windows 8 Start button icon with the Start orb from Windows 7.

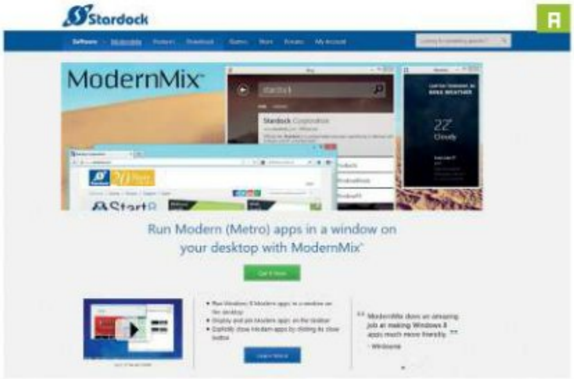
3 MODERN APPS IN A WINDOW

In Windows 10, Modern apps will be able to run in a window—unlike in Windows 8, where they can only run in full-screen mode. You can fix this with a program called ModernMix from www.stardock.com (**Image A**). The full version costs $4.99 but you can run a 30-day trial first. You can change the default behavior for apps in General settings; by default, it assigns F10 as a hotswitch, or you can use the icon in the top right of the app window.

4 COMMAND CONTROL

Win10 includes an improved Command Prompt window that now features—at long last—proper support for copy/paste keyboard commands, among other things. You can get this right now in Windows 7 or 8 with Console2 from http://bit.ly/1pFel0j. It's a free standalone program that offers many extra options over the basic Windows version (**Image B**).





Run Modern (Metro) apps in a window on your desktop with ModernMix

5 SWITCH IT ON

Task switching has been revamped in Windows 10, with a full-screen preview of all your open windows. There's a similar utility called Switcher 2.0, which runs on Windows Vista, 7, and 8, available at insentient.net. This gives you three different ways of displaying open windows, hotkeys for quickly switching between them, customizable window styles, and more.

6 VIRTUAL DESKTOPS

The final major interface change in Windows 10 is virtual desktops, which enable you to group windows and apps into different sets of different "screens." Yet again, though, there's a well-established utility that does all this and more, which is available for Windows 7 and 8. It's called Dexpot and you can find it at dexpot.de. The program is free for personal use.

7 THE POWER OF DEXPOT

Dexpot enables you to assign apps and windows to one of four different desktops. You can assign rules so that a particular app always opens on a particular desktop, and you can preview desktops as a full-screen view, then click one to use it. There's also a handy little quick-switcher that sits near the clock, and fully customizable shortcut keys. In fact, we're happy to report that just about every part of Dexpot is customizable. It'll end up saving you a lot of time. ⏻

BUILD IT

TOM MCNAMARA **TECHNICAL EDITOR**

Video Production On-the-Go

We discover that balancing size and power is a delicate process when building a specialist content creator rig

LENGTH OF TIME: **1–2 HOURS** LEVEL OF DIFFICULTY: **LOW**

THE MISSION

SOMETIMES WE BUILD SYSTEMS in this section to test out the latest hardware, or to experiment with different ideas. This time around, we're constructing a purpose-built machine. With Youtube, Twitch, and other video sites becoming increasingly integrated into our daily lives, it's a good time to think about what we use to create this content, rather than what we use to watch it. And if you want to start your own Youtube channel or get involved with video creation, you don't need a super computer.

As long as you have a CPU with four or more cores, a few hard drive trays, and a decent videocard, you can get along just fine. These bullet points are reasonable enough that we can fit them into a pretty low-profile PC that you can truck around without throwing your back out. With the type of case that we chose, you can also fit a full-sized power supply, high-performance CPU cooler, and full-length videocard. This case is even designed to stack with multiple units of the same base model.

COOLER MASTER

AN EYE FOR ITX

WE'VE BUILT WITH "SHOEBOX" PC CASES before, and they taught us that things can be a pain, due to their sheer compactness. Silverstone even ships some cases with power supplies pre-installed, along with custom shortened cables. They've a minimal footprint on your desktop and look cool, but woe betide you if you need to troubleshoot anything—you'll need to unpack entire chunks of PC guts to get at the problem, usually. So we wanted a shoebox that was reasonably easy to build into and out of. Especially with video encoding, where you want the ability to swap hard drives in and out. The Cooler Master HAF Stacker cases make those drives easy to access. You can also choose a case with the PSU mount on the front or on the back. We went with the front mount to keep the weight of the case balanced.

Inside this case we've used an Asus ROG Maximus VII Impact mobo, which employs the Intel Z97 chipset and offers up a selection of its own handy features, too. We've kept costs down by putting an Intel Core i5-4670K CPU at the build's heart, and we've the ever-popular Cooler Master Hyper 212 Evo for some moderate overclocking. Our videocard is the Sapphire Radeon R9 285 Compact, which is roughly equivalent to a GeForce GTX 760. Our storage is a Samsung 850 EVO SSD and two 3TB hard drives from Seagate.

INGREDIENTS

PART		PRICE
Case	Cooler Master HAF Stacker 915F	$65
PSU	Cooler Master V550 550W	$80
Mobo	ASUS ROG Maximus VII Impact	$230
CPU	Intel Core i5-4670K	$230
GPU	Sapphire Radeon R9 285 Compact	$240
RAM	2x 8GB Kingston Fury Black	$150
Drive Cage	HAF Stacker 935 Storage Kit	$12
HDD	2x Seagate Barracuda 3TB	$200
SSD	250GB Samsung 850 EVO	$140
OS	Windows 8.1 64-bit OEM	$100
Total		$1,447

1

CART BEFORE THE HORSEPOWER

IF YOU'RE USING an aftermarket CPU cooler like we are on this occasion, you'll need to install its backplate on the motherboard before thinking about getting the board into the case. These ITX cases generally don't have cut-outs that enable you to access the motherboard tray from the other side. Thankfully, this is an easy task with the 212 Evo cooler.

For our LGA 1150 board, you choose the middle of the backplate's three screw positions, then put the mounting screws in, and fasten the screws on the other side of the board with the nuts that should be provided. Our board also has a tall riser card, so we needed to shift the CPU fan vertically a few notches to make sure that everything fit. Low-profile RAM is also something highly recommended.

2

AIN'T THE SIZE OF THE BOAT

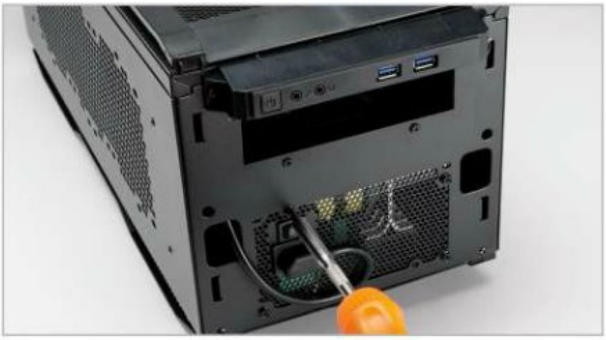
THIS SAPPHIRE COMPACT VIDEOCARD is short enough for us to install this three-tray drive cage right in front of it. Without that, we're limited to the drive mount on the 5.25-inch bay (which is removable), the one below this drive cage, and the one on a reinforcement plate (which we removed for this build). This cage also has enough room behind it that we don't require right-angle SATA cables.

This case doesn't actually come with a 3.5-inch drive cage; you need to order the HAF Stacker 935 Storage Kit from Cooler Master to get it. The SATA cables that come with our motherboard aren't long, so we slapped them in, too. It doesn't matter which port you use on the motherboard end—they can all do SATA III speeds.

3

BACKWARD AND FORWARD

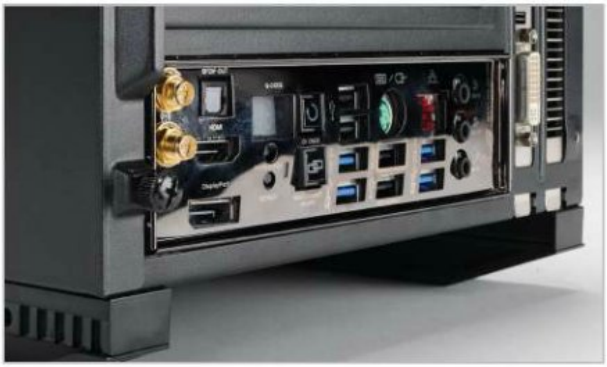
HERE WE HAVE THE FRONT OF THE CASE with the bezel taken off. This right-angle power cable gets juice to the power supply while lying flat enough to fit behind the bezel. The PSU's power switch ends up on the inside of the case, which is a bit awkward. But the bezel pops off pretty easily, giving you access to the switch in a pinch. (We should also add that this is a pre-production version of the HAF Stacker, because we're hardware hipsters. Some cosmetic stuff is different from the retail version.) The case has an intake fan below the PSU mount, and its heat is exhausted through the front of the case. Sometimes ITX cases make their PSUs expel heat into the case, which may cause overheating or lower your overclock ceiling. For our needs, this 550-watt unit is plenty. If you put in a 290 or 290X, though, we'd recommend bumping it up to 600 watts.



4

A LOVER, NOT A WI-FIGHTER

THESE TWO GOLD-PLATED COAXIAL CONNECTORS are for the motherboard's integrated Wi-Fi. You definitely want some of that in an ITX system, since it will have only one PCI Express card slot on the motherboard, and you want to use that for your videocard. Since our system is designed for mobility, we don't want to have to rely on Ethernet for network access. These coax connectors each have a nut and a washer that you need to remove before putting the connectors through the back of the I/O shield here. You re-attach them on the other side, and your coax is secure. This Asus motherboard comes with an antenna on a cable about two feet long, from which we were able to get a strong connection. Windows 8.1 recognized the adapter right out of the box, which made our initial setup much easier.

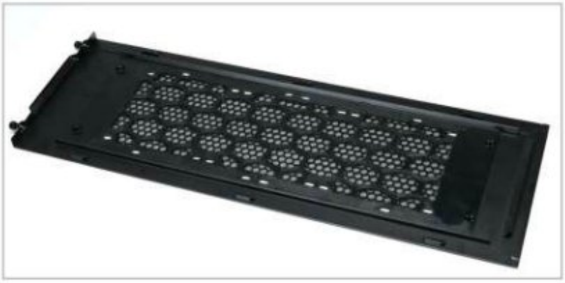


5

GETTING HIGH

THIS IS WHAT THE INSIDE of the HAF Stacker's side panel looks like. It has "captured" thumbscrews, which means they stay attached even when fully unscrewed. It's basically one big grill with a bunch of fan mounts. You can mount two 140mm fans or up to three 120mm fans. In practice, you can't use all of these, because internal components get in the way. The top of the case has no fan mounts, but it's also one giant grill. In case you were wondering, HAF stands for "High Air Flow." Cooler Master aren't kidding.

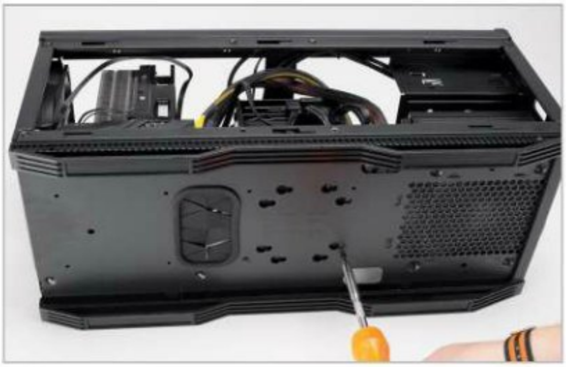
The other side panel is identical, so you can squeeze more fans in. We kept it simple and stuck with the 120mm stock exhaust fan. This ITX mobo has only two fan headers anyway, so we'd have to plug extra fans directly into the power supply, which can be noisy. On the other hand, you could use that 5.25-inch bay to install a fan controller, if you don't mind sacrificing the bay's drive mount.

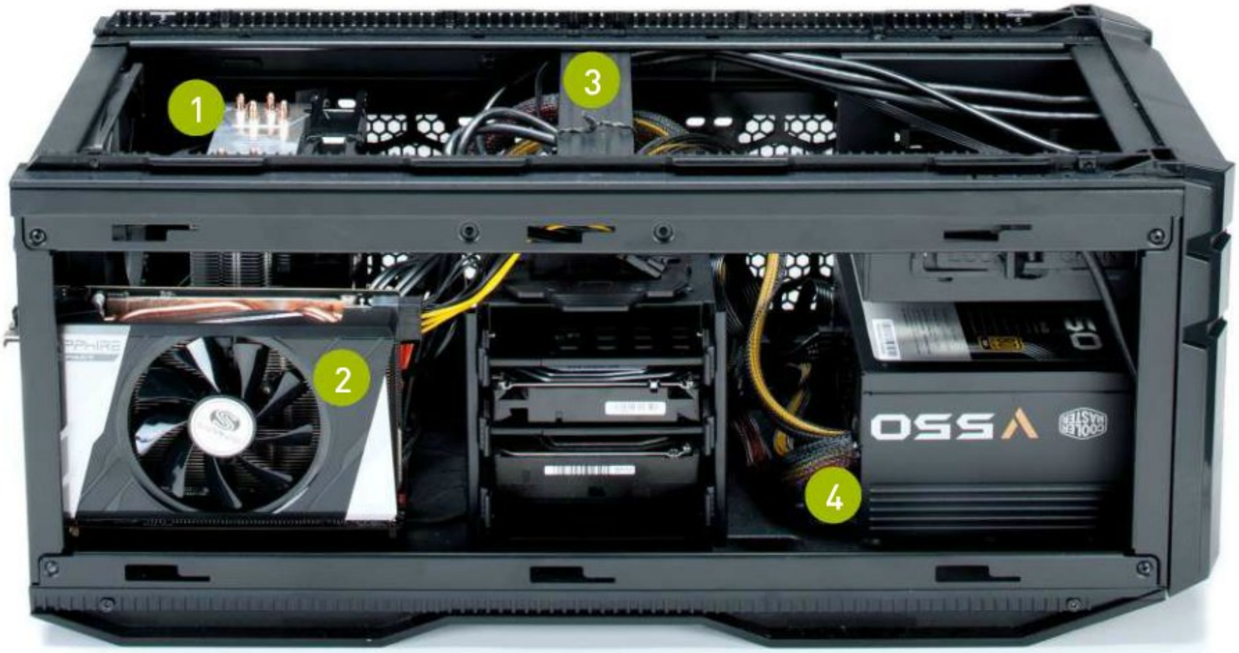


6

TANGLES AND DANGLES

THE UNDERSIDE REVEALS a couple of interesting things. Besides the drive mount, there's a set of rails and a rubber grommet. The rails give clearance for the power supply's intake. But you can also remove them and connect a second HAF Stacker. That's how the case gets its name. The grommet is for feeding data and power cables between the two cases, so they can share storage devices and a power supply. Three of these 915 cases stacked on top of each other will be roughly the height of a full ATX tower. Cooler Master also sells a "935" SKU, which combines this 915 with a 925 mid-tower that they don't sell separately. The 935 has Stacker attachment mounts both on top and on bottom, so you could build something pretty colossal.





① **You could actually squeeze a second CPU fan on the other side of the cooler, and the 212 Evo comes with an extra set of clips for that.**

② **This Radeon R9 285 boasts just one fan, but doesn't generate much heat anyway. Even so, it performs better than the Radeon 280.**

③ **We put a twist tie here to secure the thick USB 3.0 cable coming from the front panel. You can also lift the case by this crossbar.**

④ **The PSU is 5.5-inches/140mm long. As you can see from the photo, you could go another half inch without meeting too much trouble.**

IT'S A QUIET RIOT

WE MADE SURE only one drive was connected when we installed Windows, otherwise it puts a "system" partition on a drive other than the SSD. We wanted to be able to swap out the other drives, and putting the system partition on one of them makes Windows unbootable if that drive is disconnected. While we were installing Windows, we noticed it didn't recognize the mobo's integrated Ethernet adapter, which uses an Intel I,218V chip, even though it recognized the integrated Wi-Fi. We're used to the opposite being the case.

We used the Wi-Fi connection to download the Ethernet drivers, along with the latest versions of AI Suite (for managing fan speeds, monitoring temperatures, and doing some tweaking), and HomeCloud. We needed HomeCloud to enable Wifi GO, a feature that allows you to use this motherboard as a wireless hotspot, a nice extra. If your system boots without Ethernet or wireless connectivity, you can pull older drivers off of a DVD bundled with the board, or you can download the drivers to a mobile device and transfer them via a USB cable.

With just one 120mm fan in the case and another on the CPU cooler, this was a pretty quiet build. In fact, we actually removed a side panel to check the fans were spinning. Of course, the CPU fan cranks up a bit when the chip is firing on all cylinders, but it shouldn't be distracting. We took this opportunity to update the BIOS, since the newest one said it improved stability, and the one before claimed to improve performance. It's unfortunate mobo vendors are so vague about what their BIOS updates do. Either way, we couldn't resolve an issue where the PC wouldn't boot when we had a USB thumb drive plugged in.

Since we're not testing new hardware, there aren't any benchmarks to run. This build was more about concept and execution. The results will vary a lot according to what kind of video footage you're dealing with and what programs you use to edit and encode. But the Radeon R9 285 is on Adobe's "approved" list for hardware-accelerated encoding via OpenCL, and four Haswell CPU cores pack plenty of performance poke, too.

By default, this Asus motherboard will set all cores on the i5-4670K to 3.8GHz, when a load is applied. That's the CPU's official maximum "Turbo" setting, which happens when you put a load on the chip. Without this motherboard setting, one core will run at 3.8GHz when only one core is being used. When all four are in action, they'll run at 3.5GHz each. When three are being used, they'll run at 3.6GHz each; for two, they'll run at 3.7GHz. The motherboard's "Sync All Cores" setting streamlines this business and gives you a performance edge for video encoding, which typically uses all the cores and threads that you can throw at it.

If you have some downtime, this system doubles as a respectable gaming rig. We averaged 79fps in the *Tomb Raider* benchmark, using the "Ultimate" setting at 1920x1200 with TressFX disabled. *The Hitman: Absolution* benchmark averaged 48fps on "Ultra" with 4xMSAA. This compact 285 retails at a higher price than average, so it's not the best bang for your buck, but it's the best value after you've factored in size. Nvidia's partners have started coming out with mini versions of the GeForce GTX 970, but those are about $100 more.

Overall, we're happy with how this system turned out, though we might have opted for a less expensive motherboard, since the Maximus VII Impact is designed to take advantage of more exotic CPU cooling than a Hyper 212 Evo.

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HP OMEN
PAGE 70

It's not the most powerful notebook, but it's one of the most polished.

HP Omen

A gaming laptop offering plenty of temptation

THE WORD "OMEN" generally connotes bad juju for most people. For some longtime PC enthusiasts, however, it evokes fond memories of Voodoo PC's beautiful and powerful old desktops. While HP isn't bringing Voodoo PC back from the grave, it hopes to pay homage to the Omen namesake by rebirthing it as a modern gaming notebook.

Right off the bat, you'll notice that the 15.6-inch HP Omen is one sleek-looking laptop, with its machined aluminum chassis. The anodized black finish coupled with its thin 0.8-inch body gives the notebook some added sex appeal. It's also really portable for its class, weighing 4 pounds, 11.9 ounces. While we were a little dismayed to hear it uses a 1080p monitor, something we've seen dozens of times, this isn't some mediocre display. It uses an IPS panel that features a 72 percent color gamut, providing gorgeous, saturated colors. It also sports a touchscreen, making it the first gaming laptop we've reviewed that offers one.

We were generally pleased with the keyboard, which offers seven customizable color zones you can tweak using HP's Omen Control Panel software. The keys offer a satisfying amount of travel and feel tactile, as a result. You also get a column of six macro keys on the left of the keyboard, which is rare in a notebook this size. We weren't enamored of the Omen's trackpad, however. Measuring 5.5 inches across, it's so wide we often found our resting fingers interfering with our swiping gestures.

On opposite ends of the trackpad are a pair of LED lights that pulsate with the sound of your audio. It's a unique touch that gives the notebook added flair. The speakers themselves are quite good and offer decent volume firepower. Despite being licensed by Beats Audio, a company known for its bass-heavy emphasis, the audio here is balanced.

FEELING DEVILISH

Unlike the sexy chassis, the specs of the laptop aren't super fancy. It uses the same 2.5GHz i7-4710HQ CPU in the ROG G751 featured in last month's cover story. For its graphics card, HP went with the GeForce GTX 860M, the de facto GPU for thin gaming notebooks. The base model comes with two gigs of GDDR5 VRAM, but ours included four. In regard to system RAM, configs starts out at 8GB, which is fine, but our maxed-out unit came with 16GB.

CPU performance was pretty average, ever so slightly faster than our Alienware 14 zero-point's 2.4GHz i7-4700MQ processor. In GPU perf, we saw respectable gains between 20 and 60 percent. In short, our graphics tests remind us that the 860M is midrange. It will run the majority of modern games at high settings with smooth frame rates, but don't expect to max out games.

While the laptop's performance didn't blow us away, neither did its fans (pun intended). The Omen isn't silent, but it's very reasonable under load. We'd go so far as to say HP found the perfect balance between performance and acoustics. The laptop is able to keep its cool by using dual fans that pull in cool air from the bottom, which it expels through the back, meaning gamers needn't worry about warm wrists.

When it came to battery life, the laptop was pretty average. The first time we ran our video-rundown test, the notebook lasted a mediocre 172 minutes. When we turned off all the LEDs, we got an extra half hour. Our biggest concern really pertained to storage. While we love that it uses the faster M.2 PCIe standard, we're put off that it doesn't support traditional hard drives. This means you're topped off at 512GB. Luckily, the drive is really fast, and allowed the notebook to boot up in 11 seconds.

The Omen may not be the most powerful notebook out there, but it's extremely polished and well-designed. Everything from its looks, portability, and thermals are top notch. While our decked-out unit cost $2,100, if you're looking for a more affordable configuration, we recommend going with the $1,800 model, which includes a 512GB SSD, 8GB of RAM, and an 860M with 2GB of VRAM. It's still a pretty good Omen.

–JIMMY THANG

VERDICT

9

HP Omen

+ THE OMEN (1976) Beautiful touchscreen panel; sexy chassis; portable; good thermals.

− THE OMEN (2006) No hard drive support; very wide trackpad; not super-powerful.

$2,100, www.hp.com

BENCHMARKS

	ZERO-POINT	
Stitch.Efx 2.0 (sec)	962	989 (-2.7%)
Proshow Producer 5 (sec)	1,629	1,604
x264 HD 5.0	13.5	13.9
Bioshock Infinite (fps)	36.1	50.9
Metro: Last Light (fps)	30.4	49.6
3DMark 11 Perf	4,170	5,067
Battery Life (min)	234	201 (-14.1%)

0% 10% 20% 30% 40% 50% 60% 70% 80% 90% 100%

Our zero-point notebook is an Alienware 14 with a 2.4GHz Intel Core i7-4700MQ, 16GB DDR3/1600, a 256GB mSATA SSD, a 750GB 5,400rpm HDD, a GeForce GTX 765M, and Windows 7 Home Premium 64-bit. *BioShock Infinite* tested at 1920x1080 at Ultra DX11 settings; *Metro: Last Light* tested at 1920x1080 at DX11 medium quality settings with PhysX disabled.

SPECIFICATIONS

CPU	2.5GHz Intel Core i7-4710HQ
RAM	16GB DDR3/1600
Chipset	Intel HM8
GPU	Nvidia GeForce GTX 860M
Display	15.6-inch, 1920x1080 IPS display
Storage	512GB SSD
Connectivity	HDMI, DisplayPort, media card reader, 4x USB 3.0, headphone input, 2MP webcam, Bluetooth 4.0, 802.11ac
Lap / Carry	14lb, 11.9oz / 6lb, 1.2oz

CREATIVE
Sound BLASTER X7
SBX

There's a hidden panel underneath that reveals replaceable op-amps.

Creative Labs Sound Blaster X7

The gold-plated kitchen sink of soundcards

IN THE CONSTANTLY SHIFTING LANDSCAPE of PC tech, soundcards have risked becoming a footnote, like dial-up modems and network adapter cards before them. When a system seller like Dell or HP can shave even $20 off a build, it can shift the balance of power in a world of razor-thin margins. So when someone drops a device like the Sound Blaster X7 on us, it's almost disorienting. It's a $400 audio station, when people can buy entire PCs for that much money. Creative Labs faces an uphill battle. What kind of beast could this be to justify its price tag?

At the heart of the X7 is the company's top-end ZxR soundcard. It features four digital signal processors on one die, a Burr-Brown PCM1794 127dB digital-to-analog converter, a Texas Instruments PCM4220 analog-to-digital converter, and a TI TPA6120A2 headphone amp capable of driving 600-ohm cans (with a 1/4 and 1/8-inch jack available on the front). That gear might not sound familiar to you, but it's top of the line in the world of digital audio.

The back of the unit has a set of RCA jacks and banana plugs for analog speakers, and the plugs are switchable between four and eight ohms. Out of the box, the X7 will drive two speakers at up to 38 watts, and you can buy an optional power brick that will push that to 100 watts. It connects to your PC with a bundled micro-USB connection, and has a full-sized USB port to act as a host for another device, like a mobile phone or tablet. If that's not enough, the X7 has optical audio in and out. And you can adjust its settings with an Android or iPhone app via Bluetooth and NFC. And besides the microphone jack, there's also an integrated beamforming mic. The X7 will do echo cancellation and noise reduction and let you fine-tune the width of the beam.

We could talk all day about the features inside this box. Suffice it to say that it's a kitchen sink for audiophiles. The X7 also has Crystalizer, virtual surround sound, a loudness cutoff for nighttime viewing, "Dialog Plus" to make movie conversations easier to distinguish, and bass boosting, all under the collective banner of "SBX Pro Studio." But audiophiles usually look down their noses at most of these, accusing them of unnaturally distorting the dynamic range of incoming sound. Creative Labs itself will tell you that the appeal of Crystalizer is subjective. The company says that this feature can restore dynamic range lost when compressing audio down to an MP3 file and even undo dynamic range compression engineered during the compact disc mastering process.

WHERE'S THE HDMI?

For our ears, using a pair of AKG K240 headphones (the older version made in Austria) and Beyerdynamic DT 990 Pro cans, tweaking the equalizer during gaming produced cleaner acoustic distinction between booming explosions, the metallic rattle of a magazine reload, overheard conversation, and wind and rain. Part of Crystalizer's impact also comes from a hidden volume boost of three to four decibels as soon as you activate it, which is a questionable move. But you can disable SBX entirely if you don't care for it, or adjust its software sliders.

The metal knob on the front of the X7 controls volume, and pressing it mutes all audio. Unfortunately, we don't get an input selector, nor does the X7 save profiles for different devices or scenarios. When you have audio from multiple sources, it will blend together. The X7 also lacks HDMI, so its use as a home theater receiver is limited to lossy 5.1 surround sound. And although it's external, its dimensions and AC power brick disqualify it as a practical portable audio device. While the X7 is undoubtedly a premium piece of hardware, its equally premium price puts it up against devices that have better connectivity to appeal to audiophiles. Gamers who want external and portable audio can find options—in some cases from Sound Blaster itself—at a fraction of the price. **-TOM MCNAMARA**

VERDICT
8

Creative Labs Sound Blaster X7

+ GUINNESS DRAUGHT Plenty of top-shelf components; lots of connections.

− NATTY ICE Pricey; unwieldy; lacks HDMI.

$400, www.creative.com

SPECIFICATIONS

Output	38W (100W w/ upgrade)
Audio Processor	SB-Axx1
Signal-to-Noise Ratio	127dB (DAC)
Headphone Amp	Up to 600 ohms
Supplied Power Adapter	2x 38W @ 4 ohms
Connectivity	USB 2.0; mini-USB; RCA; optical audio in/out; Bluetooth; NFC
Dimensions (H x D x W)	5 x 5.5 x 6 inches

techradar.

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Turtle Beach Ear Force Z60

Are 60mm drivers the new gold standard for gaming headsets?

The Z60 might have massive drivers, but it's the flashy surround sound that really impresses.

IF YOU'VE HAD THE PLEASURE of trying out Kingston's superlative HyperX Cloud headset and sampled its thunderous bass, you'd say its 53mm driver units were big enough to power any gaming audio kit. The industry, however, apparently disagrees. The Asus Strix already boasts 60mm drivers and now Turtle Beach is getting in on the act with its Z60. The cynic in us wonders if the value in increased driver size isn't more about marketing than consumer benefit; it's a nice number to imply a quantifiable benefit over rivals, but driver circumference alone is far from a gold seal of quality.

There's substantially more on offer from this $90 surround sound headset. Did we say surround sound? Sorry, we meant DTS Headphone: X, which is a "revolutionary" new 360-degree, 3D surround tech that gives not just space but height to sound cues. If might sound a bit far-fetched, but... it isn't. You really do hear the illusion of sounds coming from high above as well as behind or around you. Turtle Beach has made a fine name for itself on the console market by combining great surround sound with strong build quality, but doesn't tend to release as many models for us PC users. It's really bringing its A game to our realm with this model, though.

The headset itself connects to an inline control which offers preset sound behaviors for gaming, music, and movies (as well as the usual volume/mic controls). Movie mode boosts the frequency range that speech most commonly occurs at to keep dialogue clear, while also pumping up the bass to keep the sound effects hard-hitting. It's designed with J.J. Abrams in mind, rather than Werner Herzog.

Game mode goes even further with the bass, boosting low frequencies to a level you can feel as much as hear. This is where the 60mm drivers come in—they're positively violent. Turtle Beach works them harder than Asus's Strix Pro cans, the result being hilariously OTT gunfire, explosions, basically anything in a lower frequency range than Samuel L. Jackson.

Music mode is as close as the Z60 comes to placating the audiophiles, flattening out the frequency response so your songs don't sound like mush. But it's only partially successful. Kingston's HyperX Cloud delivers more satisfying bass, but still scrubs up well when you need flat, true sound–aural evidence that driver size isn't the last word of the argument.

YES YOU CAN

The headset design is very similar to more expensive console models such as the PX4, and as such it's very adjustable, breathable, and strong. Construction materials are predominantly plastic, but are finished to a really high standard and are near-silent when you're fiddling with them. The microphone is perfectly functional and easily adjustable, and can also be removed if you want to use the Z60 as headphones for your MP3 player. You'll need a USB connection to make use of the surround, but there's a handy 3.5mm jack connecting the cans to the inline remote.

The Ear Force Z60 is a good all-rounder, as you'd expect given Turtle Beach's previous cans. We'd hesitate to say it's overpriced, but you can find rival offerings for much less if you're willing to ditch surround for sound quality. **–PHIL IWANIUK**

SPECIFICATIONS

Frequency Response Range	20Hz-20KHz
Driver Size	60mm
Connection Type	3.5mm/USB
Cable Length	3m
Mic	Omni-directional

VERDICT

8

Turtle Beach Ear Force Z60

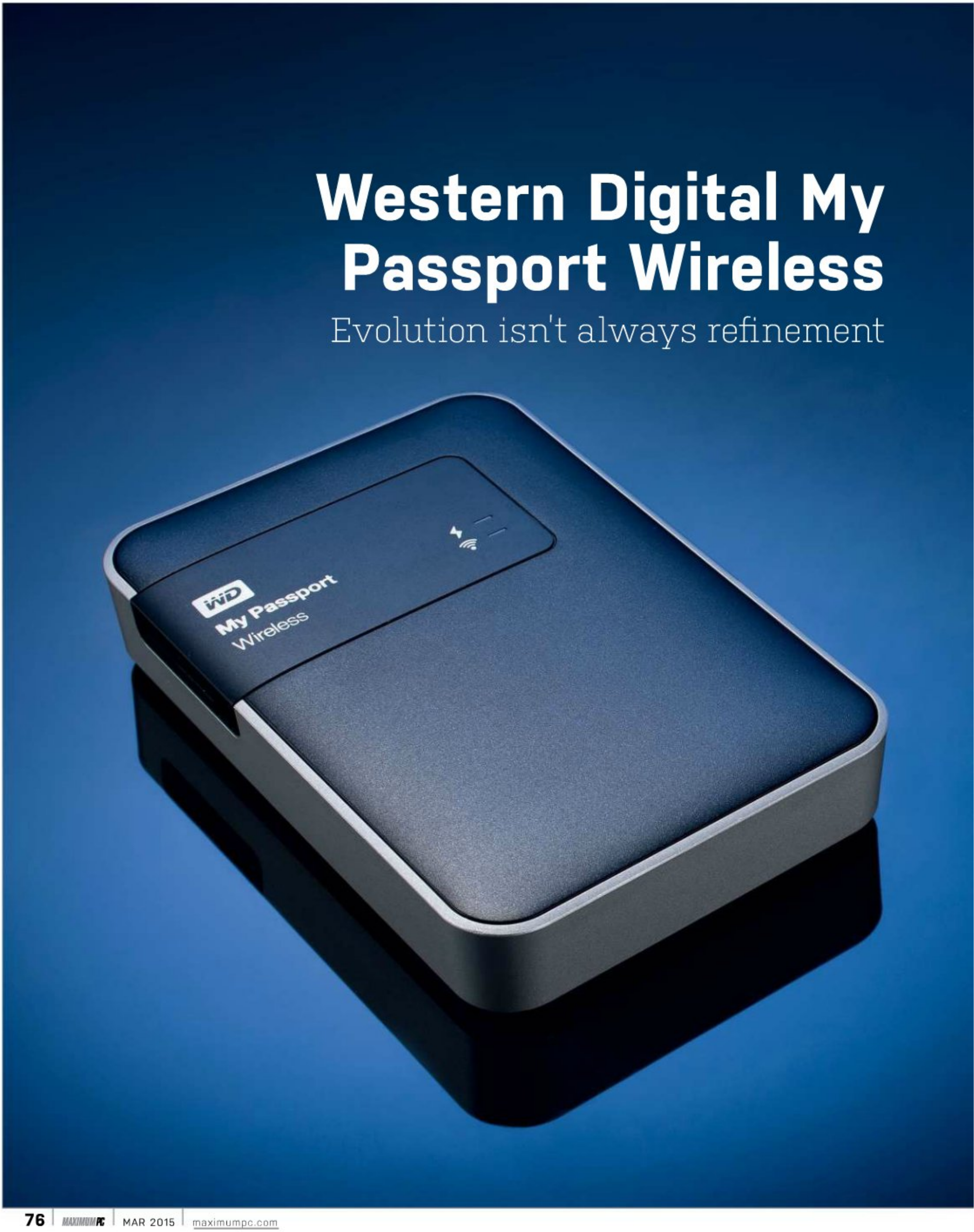
⊞ **JEDI MASTER** Surround sound that's more than marketing bluster; very adjustable.

⊟ **PADAWAN** Not the best overall sound reproduction on the market.

$90, www.turtlebeach.com

Western Digital My Passport Wireless

Evolution isn't always refinement


WD
My Passport
Wireless

WHEN IT COMES TO THE STORAGE devices found inside enthusiast PCs, solid-state drives reign supreme at this point. Their performance is crazy fast, and they have no moving parts. But there's still a lot of demand for the old mechanical drives. They may be pokey, but the cost per gigabyte is much lower. And if they're in an external enclosure, you can have a pretty handy mobile backup device. But lately, mech drive makers haven't been willing to go quietly into that good night. Western Digital's answer is a unit with a built-in wireless hub, mobile apps, a rechargeable battery, and SD card slot, in an enclosure that's about an inch tall.

The wireless aspect is arguably the biggest draw. This drive can take up to eight connections at once, and since it's a Wi-Fi hub, you can use it as a pass-through to the Internet. In this role, the drive is basically a range extender, which sounds quite handy for situations where you encounter dead spots that need a signal boost. With its internal battery, you could bring Wi-Fi to locations that don't even have electrical outlets nearby. Of course, with all that going on, the battery won't last very long.

The company claims up to six hours of video streaming before the battery dies, but adding Internet access to the mix will push that number down further. It's not easy to test definitively, because battery drain will depend a lot on the signal strength achievable by your PC or mobile device, the hub, and your Internet router. Also, if you plug the drive into your PC with a USB cable, Wi-Fi shuts off. For some reason, this is by design, and mentioned near the end of the manual, in the troubleshooting section. If you want to both power the device and connect to it over Wi-Fi, you'll have to plug the USB cable directly into the bundled AC adapter. Even then, the battery will not charge unless the unit is idle. You'll unearth this nugget in WD's online support pages. It looks like being a Wi-Fi hub *and* an external drive is too much for a USB 3.0 cable to handle.

Despite the bells and whistles, it gets all its power through a USB 3.0 cable.

DRIVING MISS DAISY

Making matters even worse, the drive transferred data over Wi-Fi at just a few MB/s, regardless of whether the battery was set to "Battery Life" or "Performance" mode. We couldn't dig up any information on what wireless speeds it's rated for, but it definitely wasn't in the 802.11g or 802.11n range. When we connected the drive to a PC over USB 3.0 and just created a network share on it, file transfer performance degraded further. The Android and iOS apps didn't report transfer speed or estimated time of completion.

When transferring files directly to and from a PC over USB 3.0, we got around 100MB/s, so at least there were no surprises there. However, this cuts off access to the drive's web interface. With that gone, you can't reset the drive to factory settings, view its battery level, or update the firmware. WD's desktop software does not expose those functions, and updating the firmware made the device forget out network router's password. Speaking of password security, you can remove the one on the device itself just by holding down the power and WPS buttons for "around" 10 seconds. That's convenient in case you forget the password, but it's poor security against unauthorized access.

The My Passport Wireless isn't a bad storage device, really. It's just one with some disappointing limitations that aren't articulated until you've already brought the drive home and plugged it in. It tries to go Swiss Army on you but ends up more like a butter knife, doing the basics of external storage correctly but being poorly adapted to functions outside of that role, for which you are paying a premium price.

–TOM MCNAMARA

VERDICT
6

Western Digital
My Passport Wireless

➕ **FLASH GORDON** Integrated Wi-Fi and battery; no power brick needed.

➖ **HOT FLASH** Limited Wi-Fi functions; low Wi-Fi speed; underwhelming security.

$180 (1TB version), www.wdc.com

SPECIFICATIONS

Capacity	1TB
Interface	802.11n Wi-Fi, SD card slot, USB 3.0
SKU	WDBK8Z0010BBK
Dimensions (H x D x W)	0.9 x 5 x 3.4 inches
Weight	270g
Warranty	Two years, worldwide

Philips BDM4065UC

Is this the screen we've been searching for?

Philips has adapted one of its 4K HDTVs to create a no frills 40-inch monitor on a relative budget.

TEN YEARS. It's a staggeringly long time in tech. Yet it was nearly a decade ago that Dell wheeled out the monitor by which pretty much all others have since been measured, the 3007WFP. Yes, some interesting technologies have recently cast doubt on the Dell's mastery, but a decade-long reign at the top is extraordinary. It's impossible to imagine for any other major component. But it looks like a new high-end default in the monitor market has arrived, at least in terms of the form factor—if perhaps not this actual Philips model. Let's find out why.

Even before the BDM4065UC arrived, we had an idea the HDTV market was going to be relevant. HDTVs have always offered better value than monitors because they're cranked out in mega volumes. The problem is, until recently, they've all been 1080p at best. Once you get beyond 24 inches, that means big pixels. Step that up to 40 inches or more and things get really ugly. That makes for pretty poor PC monitors.

Meanwhile, budget 4K monitors emerged, but only at 28 inches. Hardly titchy, but when you've got nearly 4,000 pixels across the horizontal, the dot pitch is tiny—and that generates all kinds of problems in Windows. Either you leave the scaling at 100 percent so that everything is squintingly small, or you tweak the Windows and browser scaling settings and everything looks hideous.

But what if you had a 4K PC monitor that was 40 inches in diagonal? Then you'd have a monitor on an epic scale with a pixel pitch in that workable window. And guess what, 40 inches is bang into budget HDTV territory in terms of panels and production volumes. That explains why this massive, 40-inch 4K Philips is cheaper than existing 30-inch 2560x1600 pixel monitors.

Hold on though, you can't just take a 4K HDTV off the shelf and use it as a PC monitor. That's because the bandwidth limitations of the current HDMI standard restrict it to just 30fps over a single connection. What you need is the latest DisplayPort 1.2 interface. Instead, Philips has taken one of its budget 4K HDTV models, ripped out the TV tuner stuff, and bunged in a DisplayPort 1.2 interface. No frills—just the minimum you need from a PC monitor.

That's great news. The main upsides are the affordability—OK, $850 is still a lot of money, but spread that over six or so years and the annual cost looks reasonable. Then there's the slimline chassis and the super-skinny bezel in HDTV style. Sitting next to that epoch-defining Dell 3007, the old master looks tiny, dated, and knackered.

It's not all good news. The most obvious downside is a stand that doesn't adjust. At all. Though you do have the option of using the 200mm VESA mounts. Then there's the panel itself. In some ways it's a glorious thing on a wondrous scale. Once you've seen something like *Shadow of Mordor* running at 4K on a 40-inch panel, you're ruined for other screens. Oh, and if you're wondering, the semi-gloss panel surface works well. It had us a bit worried, but reflectivity is blessedly limited.

NO 4K FRILLS

Where the HDTV-ness kicks in with a big negative is the Vertical Alignment, rather than IPS tech. It delivers lovely deep blacks and rich colors, but also serves up viewing angles that are basically a bit broken. If you sit back far enough, the issue resolves—but this is a PC monitor, the whole point is you sit close. Is it a deal-breaker? Probably not, but it's enough, along with the stand, to make us wonder whether the BDM4065UC is only suitable for early adopters.

Of course, what we haven't mentioned is the sheer load any 4K panel puts on your graphics card; no single GPU can currently run the latest games at 4K and full detail. Even multi-GPU setups with high-end cards will struggle. In mitigation, this screen looks pretty decent running 1440p interpolated. So you could take the long term view—buy now and plan on a GPU upgrade in a couple of years. But it's a different psychology from buying something that's best from the start.

Plenty to think about, not least the tantalizing glimpse of the 40-inch 4K form factor that could be the weapon of choice for high-end gaming for the foreseeable future.

–JEREMY LAIRD

VERDICT
8

Philips BDM4065UC

+ NEW WORLD Really nice HDTV-style chassis/bezel; 40-inch 4K; cheaper than many 30-inch monitors.

− OLD WORLD Vertical Alignment issues; stand not adjustable; still quite expensive.

$850, www.philips.com

SPECIFICATIONS

Size	40 inches
Native Resolution	3840x2160
Panel Type	VA
Colors	8-bit
Contrast	5,000:1
Viewing Angles	178/178 degrees
Response	8ms G-to-G (3ms with overdrive)
Inputs	DisplayPort, HDMI, MHL, VGA
Stand	Non-adjustable (200m VESA support)

SABERTOOTH Z97 MARK S
THERMAL ARMOR
ASUS

The limited edition Mark S is a stunning-looking board, but its performance is a little off the pace for the price.

Asus Z97 Mark S Sabertooth

A super-special Z97 primed for winter warfare

SO, YOU WANT TO STAND OUT from the crowd and build an all-white PC? Well let's see how far you can get. Case, no problem. Many case manufacturers make them. PSU? Check. There's a few of those around as well. Graphics card? Tick. Harder to find but there are one or two available. White motherboard? Well, that's much more of a problem, sir. White motherboards are like the Holy Grail of the modding world. In fact, giving it some serious thought, we can only think of two board manufacturers that ever ventured into the expensive world of producing white PCBs: Sapphire and Soyo. Hold on, ancient Abit made one too, so that's three. And mentioning those last two long-forgotten names will give you an idea of how long ago it was.

All is not lost however because Asus has come to the rescue with a limited edition white version of its Z97 Sabertooth motherboard. The Sabertooth Mark S (which carried the codename Sabranco for a while) is an absolute stunner, too. It may seem a little shallow to get excited about how a motherboard looks, but it must be said that even us cynical old hacks cracked a smile and tipped our hats in approval at just how classy the Mark S looks. The Mark S isn't an unrelenting sea of white, however, as the TUF Sabertooth "thermal armor" sports a natty white and gray camo scheme, beloved of Arctic-based Special Forces teams and *Battlefield 4* players.

It's up to you to decide whether this enhances the white PCB or makes you wish Asus had gone the whole hog and made everything just plain white, we're still not sure. Even the reinforced backplate, or TUF Fortifier technology as Asus calls it, gets the camo treatment. But, why oh why Asus, do you go and compromise the scheme by adding a couple of green and beige ports when every other port and slot is black?

BATTLE READY

Hardware-wise the board follows the lead of the Sabertooth Mark 1; two PCIe 3.0 x16 slots running at x16 with a single graphics card, or x8/x8 when two cards are used. Connectivity extends to a single PCIe 2.0 x4 slot which sits near the bottom of the board and another three PCIe x1 slots. Six edge-mounted SATA 6Gb/s ports are supported by the chipset along with a SATA Express port. A further two SATA 6Gb/s ports placed towards the base of the board are looked after by an ASMedia controller.

One thing notable by its absence is the chipset-supported M.2 slot. But pull off the 'thermal armor' and it becomes plain why it doesn't feature—there's simply no room.

Asus's TUF range is all about cooling flexibility and thermal monitoring, and one look at the Thermal Radar 2 section in the Asus software AI Suite shows it isn't mucking around. It's probably the most feature-crammed thermal management package of any mobo currently available, with no less than 13 pages of settings that enable you to tinker with just about everything, cooling wise. A quick word about the dust prevention package Asus has included; that word is comprehensive. If it's a port and it's not being used, there's a rubber bung for it, but keeping with the overall scheme, the covers for the spare PCIe and memory slots are colored white.

The problem is the special edition premium adds a special premium price tag. That wouldn't be an issue if there was the sort of feature set you get with the pricey ROG boards, or the same benchmark levels. Unfortunately the whitewash aesthetic is what you're paying for here, not some beefed-up PC performance. **–SIMON CRISP**

BENCHMARKS

	Asus Z97 Mark S Sabertooth	Asrock Z97 Extreme4	Gigabyte Z97-X SLI
Cinebench R15 (index score)	756	**778**	746
X264 v4.0 (avg fps)	45.69	**47.12**	45.32
AS SSD Seq. Rd (MB/s)	**502**	480	482
AS SSD 4k Rd (MB/s)	**24**	21	20
Price	$330	$171	$138

Best scores are bolded.

VERDICT

8

Asus Z97 Mark S Sabertooth

+ BIG CAT Looks cool; great thermal management and dust prevention packages.

− ALLEY CAT Too expensive; no chipset-supported M.2 slot.

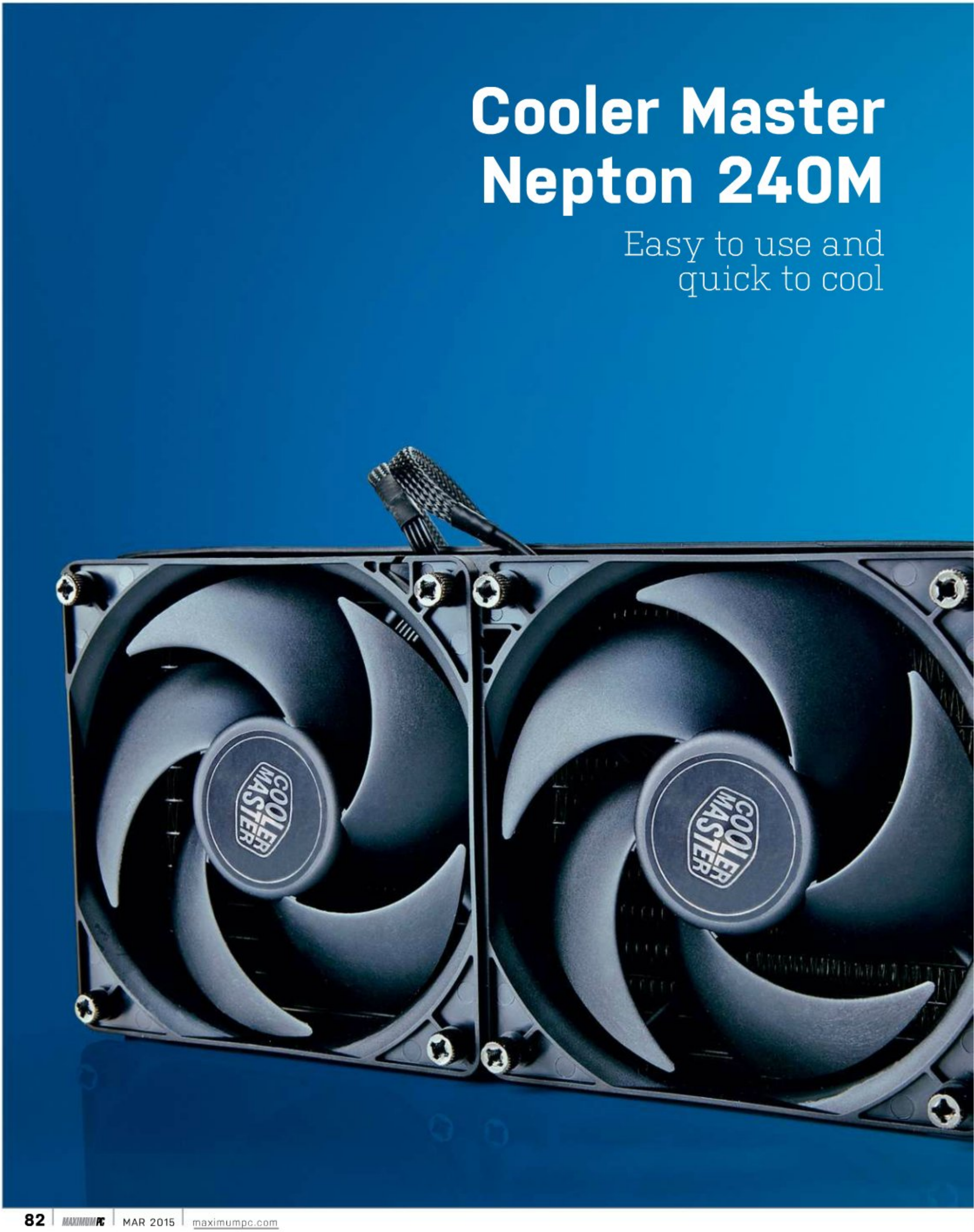
$330, www.asus.com

SPECIFICATIONS

Socket Support	Intel LGA 1150
Chipset	Intel Z97 Express
Memory Support	4x DDR3 DIMM up to 1,866MHz
Max Memory Supported	32GB
Storage	8 x SATA 6Gb/s, 1 x SATAExpress
Warranty	Five years

Cooler Master Nepton 240M

Easy to use and
quick to cool



COOLER MASTER, somewhat unsurprisingly, sure does know its CPU cooling tech. The previous Seidon range was one of our favorite ever closed-loop liquid chip chillers—we even had the 240mm version keeping one of the *MaxPC* test rigs under control since it arrived in the lab, until our tech-battering testing methods stripped the power cables from the pump...

The new Nepton lineup is most definitely built from the same cooling DNA as the Seidon. It uses an almost identical mounting setup as the previous generation, but ever-so-slightly more evolved. The big win for the Cooler Master bracket is the fact you attach the mounting mechanism to the board first and then the pump to that secured bracket. When you're replacing the CPU cooler on a machine that's already built into a chassis, that's a freakin' god-send.

It means you don't need a third hand to juggle the cooler, bracket, and screwdriver when fitting the Nepton—so long as you've got a big enough cutout in the chassis' mounting tray behind the CPU socket fitting is a doddle. The use of long-stem thumbscrews on the twin fans is a neat touch, too. Attaching them to the 240mm radiator is simple. Just like everything else with the Nepton's mounting setup.

Fingers crossed though you only need to go through the trials of fitting it once, which means that while installation is an important factor, cooling performance trumps it. Thankfully the Nepton is also a mighty impressive chiller. It's not the absolute coolest we've tested recently—the Zalman Reserator 3 Max Dual just about takes the honors with the lowest CPU temperatures—but Cooler Master is only just a little shy with this Nepton. Where it does win is in just how quickly it can return your CPU from peak to idle temperatures. Even running with a 4.5GHz overclock the Nepton brought our Core i7-4770K back to idle in just 15 seconds—its competitor the Thermaltake Water 3.0 Ultimate needs its full 360mm radiator to manage that sort of cooling performance.

A great all-rounder that's our current king of cooling.

TICKING ALL THE BOXES

The peak-to-idle temperatures are so important because of the variable speeds of today's processors. When you've got CPUs switching from 800MHz up to 4.5GHz, there's a huge amount of variation. Your cooler needs to be able to keep up. There's little use in your chip chiller letting the processor's heat get out of hand after it's done all its heavy number-crunching and is just sitting there, kicking back.

And there's another reason why the Nepton is able to best even the 360mm Thermaltake Water 3.0 Ultimate. The huge Thermaltake radiator is very effective, but simply too awkward to fit in most chassis. The extra length of its radiator is great on the cooling front, but needs an absolute monster of a PC case to be able to cope with it. In these days where even Mini-ITX cases have space for a 240mm radiator, the Water 3.0 Ultimate looks out of place.

The svelte radiator, with its effective performance and ease of fitting, makes the Nepton our pick of the current closed-loop offerings. Upgrading your PC's cooling is not all about performance. Being able to get your new chip chiller to fit, and do it without requiring a complete rebuild, is arguably more valuable than a few less degrees Celsius on average, which you'll never notice. The Nepton 240M then may not be the outright coolest chip chiller you can buy, but it's one of the finest all-round packages out there. –**DAVE JAMES**

VERDICT
9
KICK ASS!

Cooler Master Nepton 240M

⊞ **MASTER** Simple to fit; robust build; impressive cooling performance; a great all-rounder.

⊟ **ACOLYTE** Not quite the coolest chiller on the block.

$110, www.coolermaster.com

SPECIFICATIONS

Radiator Dimensions (H x D x W)	4.7 x 1 x 10.8 inches
Radiator Size	240mm
Radiator Thickness	27mm
Fans	2x 120mm PWM
Motherboard Connections	2x 4-pin

BENCHMARKS

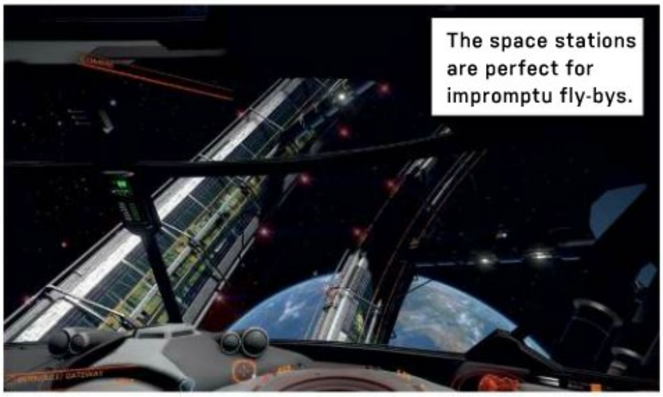
	Cooler Master Nepton 240M	Thermaltake Water 3.0 Ultimate	Corsair H100i
Idle Temperature (°C)	39	**36**	39
Peak Temperature, Stock Clocked (°C)	53	**50**	54
Peak-to-idle Time, Stock Clocked (sec)	8	**4**	35
Peak Temperature @ 4.5GHz (°C)	62	**60**	66
Peak-to-idle Time @ 4.5GHz (sec)	15	**13**	21

Best scores are bolded. Tested on a Core i7-4770K system.

RESOURCE
EXTRACTION SITE
8.86km

You don't have to kill in *Elite: Dangerous*, you can mine, explore, and make your fortune from stellar cartography instead.

The space-based dogfights are glorious with a good stick and the almost vital TrackIR.



The space stations are perfect for impromptu fly-bys.

Elite: Dangerous

Should have sent... a poet

FROM THE DAYS AND NIGHTS a youthful *MPC* spent crowded around a tiny television, hooked up to our Spectrum 128k, trying to figure out how to dock in the first *Elite*, to finally getting *Frontier: Elite II* for Christmas on the Amiga, then bug-fixing our way through *First Encounters* on the PC, this compelling franchise is utterly intertwined in our gaming life.

Thank the maker then that *Elite: Dangerous* isn't a stinker. We would have been wholly heartbroken to find David Braben had just phoned in this long-awaited sequel. But that's exactly what we were expecting when, on the back of an amazing pitch by Chris Roberts for *Star Citizen*, we saw Braben appear with a few sketches, some grand promises, and his hand out for a bit of crowd-funded cash.

Having played *Elite: Dangerous* since the first alpha, though, we've been blown away by how polished and how dedicated Frontier Developments has been in creating this expansive space sim. It's robust, involving, and continuously evolving. Plus this first release isn't the end; there will be future upgrades and expansions which promise to seriously affect the galaxy and your game.

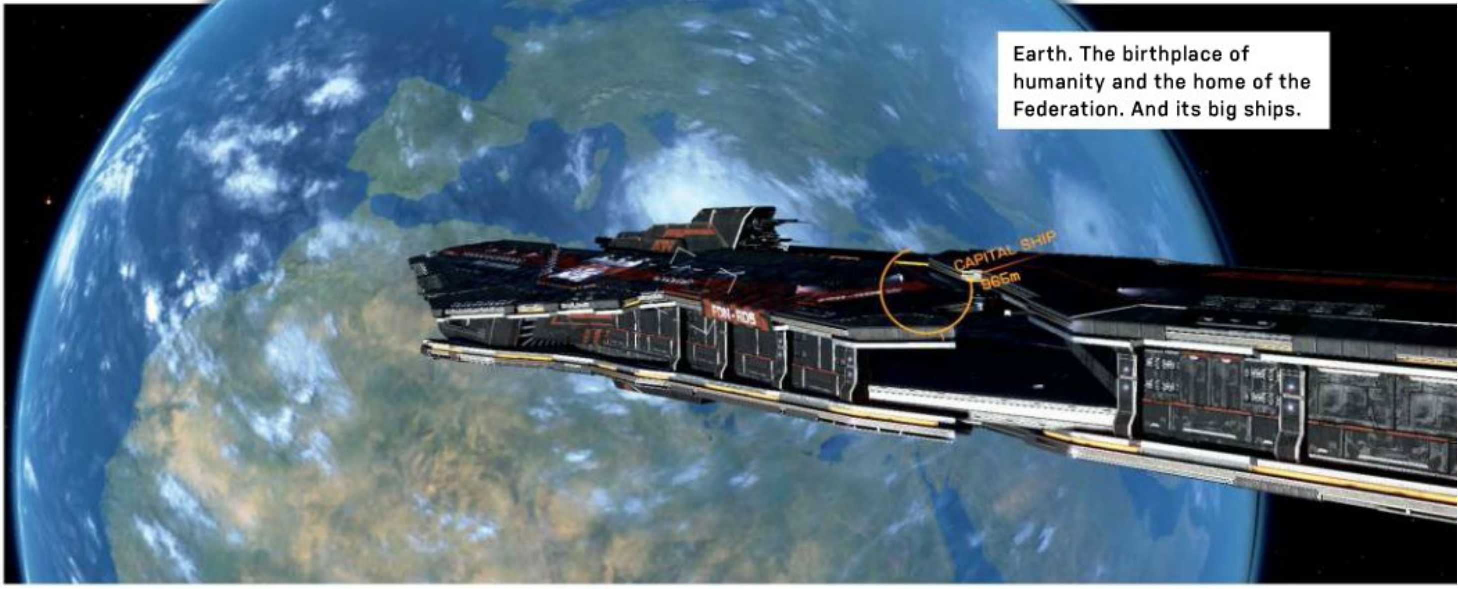
FORTUNE AND GLORY, KID

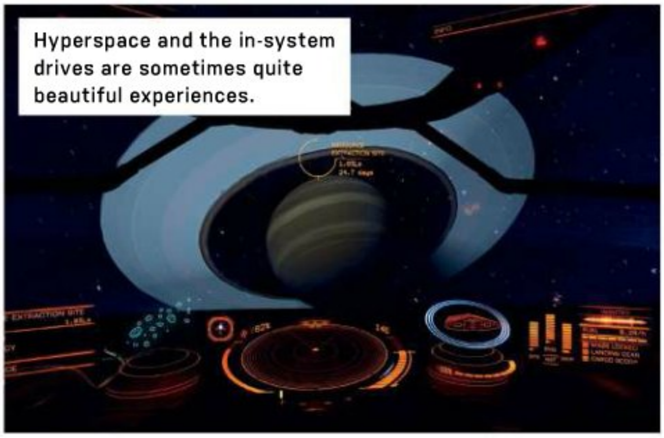
For the uninitiated, *Elite: Dangerous*, together with all its prequels, is a simulation of a life in space. It's an open universe in which you start out with a small ship, a thousand credits, and an entire galaxy in which to make your fame and fortune. And there are many ways to make your way in this life—legal or illegal, trading or piracy, civilian or military.

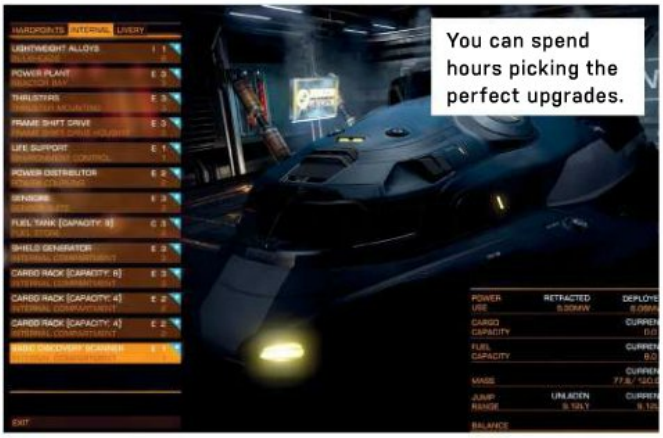
It's not as initially ambitious as space rival, *Star Citizen*. At launch there is no getting out of your ship, there's no walking around space stations, having firefights with boarders, or transitioning through a planet's atmosphere to land on its surface. That's all being planned for future updates but means Frontier Developments can concentrate on getting its initial phase as polished as possible. But don't think that makes *Elite: Dangerous* half a game at launch, there's still a huge amount to do.

This openness and the vastness of the galactic map though can be incredibly daunting in the beginning, even for a veteran *Elite* player. The 1:1 scale of the galaxy makes for an almost endless game world, but one that's meticulously modeled, offering the most accurate star map possible right now.

So, where to start? *Elite: Dangerous* is a complex beast and the pre-flight controls checklist you go through on your first flight offers barely a passing glimpse at the intricacies of your ship's controls and capabilities. Thankfully, there's a comprehensive offline tutorial section.


Earth. The birthplace of humanity and the home of the Federation. And its big ships.


Hyperspace and the in-system drives are sometimes quite beautiful experiences.


You can spend hours picking the perfect upgrades.

You begin your life in Federation space, some 40 to 50 light years from the birthplace of humanity, Sol. It's safe space. Mostly. There are the odd pirates and trigger-happy authority figures keen to exact retribution for any infraction of law, but for the most part you can avoid confrontation if all you want is a quiet trader/miner's life.

Frontier Developments knew the game needed at least some focus though and so at launch, the battle for the Imperial Throne has kicked off. The fight to succeed the dying emperor is the story thread of the game. Travelling to Empire-controlled space should be interesting... This is all told in text form though, in sparse feeds when docked at one of the varied space stations. From the off it all feels very far away and it's difficult to know how it really affects you when you're such a long way from the empire's heart in Achenar.

TEXT ADVENTURE

The reliance on text as the only form of interaction in the game, outside of comms chatter with the scattered online human players, is one of the few disappointments with the otherwise polished *Elite: Dangerous*. The level of disconnection it engenders is potentially dangerous for players who want a little more direction in their gaming experience.

But *Elite* has always needed investment from the player and a willingness to immerse yourself in the role. This isn't a galaxy in which you are the chosen one, just another person trying to get by in life. It's certainly not the easiest game to get into, but the rewards can be great. Though again these rewards are entirely personal and mostly emotional—the feeling you get from that first big bounty kill, the satisfaction from spending an hour meticulously upgrading your ship, the first flight in a brand new craft, or your first trip to Earth.

And these experiences are made all the more intense by the fact that David Braben has created an *Elite* MMO. But don't let that put you off—the galaxy is big enough that you don't need to fear eternal ganking the minute you leave dock. And you can opt to play solo, where you simply need a limited net connection to keep missions and the economy updated. Or you can play with friends in an exclusive group, experiencing the galaxy together with your friends, creating your own stories out in the inky black. The fact that everything is saved on an external server gives a rogue-like quality to *ED*. Every decision can be final and can be fatal. Ship insurance means you won't lose everything if you've left yourself enough emergency cash, but if not, those long journeys and battles can get awful tense.

We won't pretend it's the perfect game—it can get grindy scaring up cash for a new ship or vital upgrade—but your experiences in this brave new frontier will be entirely your own and brilliant. –DAVE JAMES

VERDICT **9**

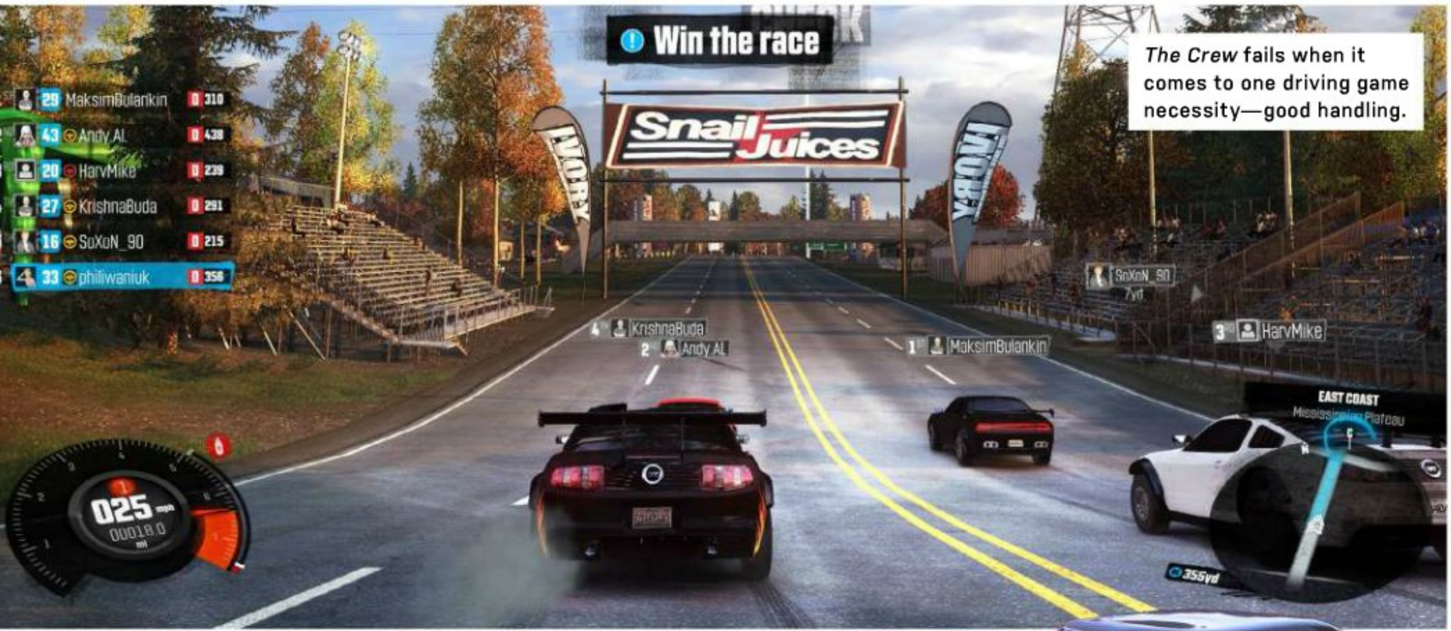
Elite: Dangerous

+ ELITE: Huge scope; open universe; striking visuals; great soundscapes; intense space battles; continually evolving.

− MOSTLY HARMLESS: No hand-holding; little direction; can get grindy; text-only interaction breaks immersion.

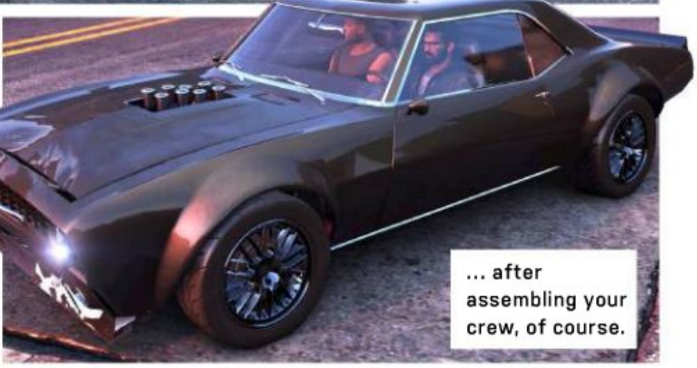
RECOMMENDED SPECS: 2GHz+ quad-core CPU; 4GB RAM; Radeon HD 7000/GeForce GTX 600 series.

$60, www.elitedangerous.com, ESRB: T



The Crew fails when it comes to one driving game necessity—good handling.

Time to ignore that mini-mission and head for Vegas...



... after assembling your crew, of course.

The Crew

A racer that owes more to the vastness of MMOs than the microscopic love-ins of most of its rivals

SUCCESS AND FAILURE seem equally absurd for *The Crew*. It's the most detailed and expansive playground a driving game has taken place in for years, and you're free to roam its every highway, dirt track, and city block with your friends—sounds like a sure thing, right? Well, it's also an always-online, plot-driven driving game in which you play a street racer posing as an undercover cop pretending to be a street racer. Who, at times, drives through the wilderness to find comms towers which unlock activities on your map, because Ubisoft's nothing if not consistent. Suddenly that sure thing now has a large truck in front of it.

It begins with a narrative-heavy prologue in which the plot points of every *Fast and the Furious* and *Need For Speed* are duly ticked off the great driving game checklist—illegal racing gang, menacing electronic music, FBI involvement, scores to settle—and you're introduced to the salient gameplay systems. It's clear *The Crew* expects you to stick around for the long haul: the last of its five disciplines (street, dirt, performance, raid, and circuit) unlocks at level 40.

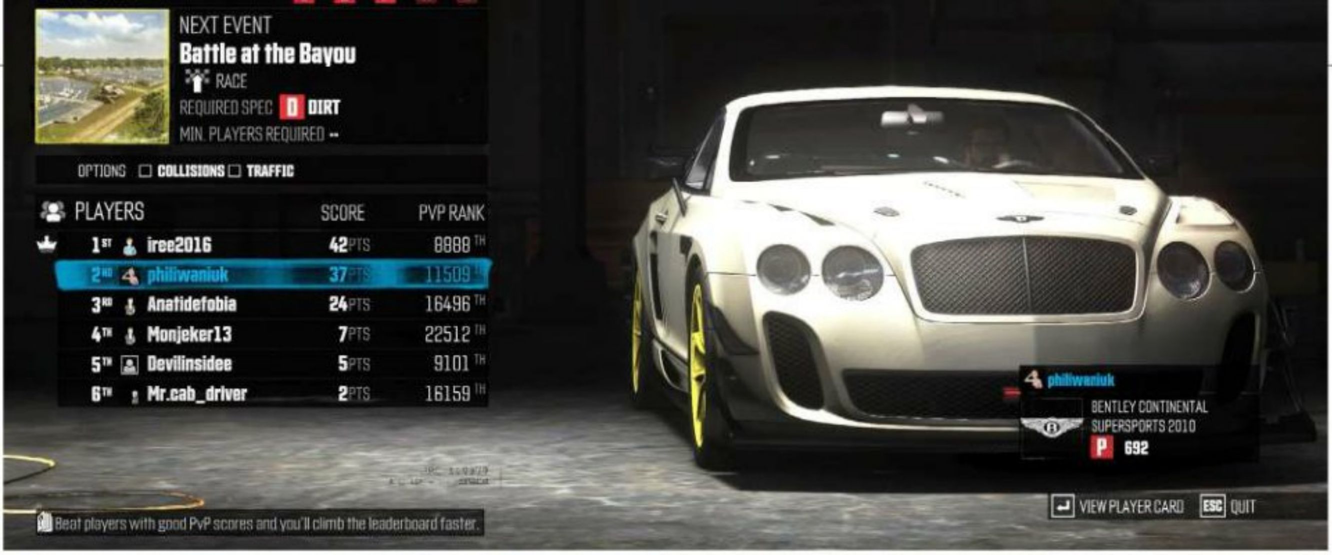
However it also—mercifully—allows you a lot of freedom once you clear that prologue. Freedom to ignore the story mission pinging in your mini-map and drive from Detroit to New York on a whim, just to see how long it takes. Freedom to invite your friends into an eponymous Crew and just drive, taking in the sights of Florida's beaches as you natter over your headsets.

THE OPEN ROAD

The world map is by far and away the game's strongest asset, packing enough environmental variation into its scaled-down USA for you to feel the culture shock when you arrive at the gaudy Las Vegas strip after minutes of cruising through serene mountainside scenery. Nobody does a Belgian freeway quite like *Euro Truck Sim 2*, of course, but for those yearning for a bit more drama in their long-haul virtual drives, *The Crew* is absolute wish fulfilment.

Perhaps if it had focused on doing that one thing really well, this would've been a better game. But by trying to also provide a facsimile of *Need For Speed*, *Burnout*, and *Far Cry 4* (lest we forget the comms towers) it spreads itself too thinly and exposes the elastic bands powering the whole operation.

It's most pertinent during the many uninspired story missions. Sometimes you're asked to drive from A to B as quickly as possible, just because, while someone dutifully recites narrative exposition to you. Other mission types rely on mechanics that are simply too unrefined to glean enjoyment from—step forward sketchy police evasions and downright perplexing "takedowns," in which you attempt to ram a wildly rubberbanding enemy.


NEXT EVENT

Battle at the Bayou

RACE

REQUIRED SPEC: D DIRT

MIN. PLAYERS REQUIRED: --

OPTIONS ☐ COLLISIONS ☐ TRAFFIC

PLAYERS		SCORE	PVP RANK
1ST	iree2016	42PTS	8888TH
2ND	philiwaniuk	37PTS	11509TH
3RD	Anatidefobia	24PTS	16496TH
4TH	Monjeker13	7PTS	22512TH
5TH	Devilinsidee	5PTS	9101TH
6TH	Mr.cab_driver	2PTS	16159TH

philiwaniuk

BENTLEY CONTINENTAL SUPERSPORTS 2010

P 692

Beat players with good PvP scores and you'll climb the leaderboard faster.

VIEW PLAYER CARD
ESC QUIT

ABOVE LEFT Hit the dirt to get the better of more powerful road cars.

ABOVE RIGHT Looks like it's time to introduce the next driving game cliché.

TOP There's a huge number of levels across five racing disciplines.

There are glimmers of inspiration among the busywork. One race pits you in a dirt car against a street racer on a route in which off-road paths intersect the road. Follow your opponent on the asphalt and you're hugely outpaced, but seek out the muddy alternate routes and you'll just squeeze the victory. It's unrealistic to expect every race to be so high-concept, not least because there are legions of them, but *The Crew* isn't *Planescape: Torment*, nor was anyone expecting it to be. It doesn't need reams of story missions.

No, it needs a better handling model. One that lets you really enjoy the world on offer. It's by no means disastrous, but all the more annoying for always feeling one menu tweak away from "right." Any such deadzone/sensitivity alchemy is a fool's errand though. The shifting of weight will always feel slightly too sluggish; suspension always just a shade too spongy. And for a game that actively encourages corner-cutting, its kerbs are worryingly severe—mount the sidewalk as you wrestle for control in a corner exit and the game responds as if you're in a monster truck running over another, smaller, monster truck. Perhaps the streets of Chicago really are rubberized and four feet higher than the street, and we're displaying our ignorance.

SOCIAL SPEEDER

Brave these not insignificant failings, and you'll still find enduring enjoyment from *The Crew* built on its online play (connection losses and crashes have cleared up after its turbulent launch week).

It's a uniquely social racer in which you can invite a few friends and drive aimlessly or take on a story mission together in four-player co-op. There's the faction war to involve yourself in, reppin' for a map region and contributing to its overall standing. And there's the simple, mindlessly compulsive PvP in which the most powerful car always wins and nobody cares because each race showers everyone in XP and money.

It's always easier to look favorably on a game that at least tries to do too much than on a focus-tested bore. Fortunately *The Crew*'s failings fall firmly into the former category, and though they're glaring and at times very frustrating, the potential to carve your own experience out of its rough-and-ready content saves it from mediocrity. Not perfect, but not awful either. –PHIL IWANIUK

VERDICT 7

The Crew

SPEED KING: Exciting, extensive, and detailed racing environment; potential to craft your own unique experiences; freedom to take your own route.

SLOW COACH: Dull races; superfluous story lacks originality; poor handling model.

RECOMMENDED SPECS: Win8; Intel Core i5-750; 8GB RAM; Nvidia GeForce GTX 580 or AMD Radeon 6870 (1GB).

$60, thecrew-game.ubi.com, ESRB: T

Snakes alive! Big Boss is back, and he's taking prisoners.

You can interrogate guards to find hidden weapons.

Vehicles are handy for quick escapes if you're spotted.

Metal Gear Solid V: Ground Zeroes

An intricate stealth sandbox with extra depth

AT THE SOUTHERN TIP OF CUBA, along a wind-battered coastline, lies Camp Omega. Here, prisoners of war are beaten, tortured, and brutally interrogated, all in the name of protecting the US of A. Sound familiar? It's no accident this grim place draws close parallels with Guantanamo Bay. Despite its obvious fetishism for the military, the *Metal Gear Solid* series has always been anti-war, and this is writer/director Hideo Kojima's most provocative statement yet.

Prisoners in orange jumpsuits cower as rats scurry around their feet. Spotlights shine from towers through pounding rain, always watching. Armed guards—who seem almost as miserable as the detainees—patrol the base, their raincoats billowing in the howling wind. It's an overwhelmingly bleak, but powerfully evocative setting, and it's the centerpiece of *Ground Zeroes*, a single-level prologue to the forthcoming *Metal Gear Solid V: The Phantom Pain.*

You are Big Boss, a legendary former CIA operative who, after being betrayed by the government, formed his own mercenary army. Two prisoners are being held captive in Camp Omega, and he needs them alive. This is, like previous entries in the series, a stealth game. You'll want to sneak in, extract the prisoners, then escape without alerting anyone. But that's just one of many ways to complete the mission, and it's this freedom that makes *Ground Zeroes* worth spending cash on—despite the fact that, at first, it seems little more than a demo.

You'll see the credits roll and you'll think, is that it? But then you notice you're at 8 percent completion. Clearing the main mission unlocks four more that alter the camp's layout, patrol patterns, weather, and time of day, creating an entirely new set of challenges. In one mission you have to assassinate two war criminals. Another sees you destroying anti-air guns. They might not sound the best, but it's the sheer number of ways to approach each objective that makes *Ground Zeroes* special.

HIDE AND SEEK

While *Metal Gear Solid* games are typically story-heavy, the focus here is squarely on the stealth. Except for intro and outro cutscenes, all of your time is spent playing. It's a remarkably detailed, interactive world, filled with clever, creative ways to evade, distract, or subdue enemies.

The small army of guards feel like people, not drones. They're impressively reactive, and respond to suspicious noises with a mixture of curiosity and trepidation. If the alarm sounds, they'll work together to pin you down. They follow set routines, but sometimes they'll surprise you.

How you reach the prisoners is left entirely to your imagination. A ranking system rates you on how quickly, quietly,

Big Boss admires his handiwork at the end of a mission.

Revengeance's Raiden stars in a bonus mission.

Rescue other prisoners for bonus intel.

and efficiently you complete the mission. You can dumbly charge through the majority of the game with your guns blazing, but the fun (and challenge) lies in learning the map and outsmarting the AI to get the best score.

The camp is big, and a testing ground for *The Phantom Pain*'s open-world stealth, which is a first for the *MGS* series. But it's small enough that, after a few hours, you'll have a fairly accurate map of it in your head. It's a brilliantly designed space, and 15 hours in, we're still finding new ways to navigate it. There are vents to crawl through, towers to climb, and roaming trucks to hide in the back of. By confining you to this single locale, the game can really push the limits of the stealth and AI. *Ground Zeroes* is, really, a proof of concept for a newer, more modern take on the series' established stealth. It retains that distinct *MGS* feel, but with tighter controls. Anyone who played the old games will recall the pain of wrestling with the clumsy three-step stand/crouch/prone button. This is gone. You can now transition seamlessly into a crawl or crouch from a run or walk. It's the first *Metal Gear* game where movement actually feels intuitive.

The controls are still slightly idiosyncratic in places. You have to play Twister with your fingers to simultaneously hold a guard up and interrogate him, for example. Like all third-person games, you'll benefit from using a pad. It's clearly been designed with a controller in mind, and the analog stick is used to control the speed of Big Boss's movements. Nudge it slightly and you'll almost tiptoe. You can achieve the same effect by holding the Control key, but it feels more intuitive using the stick.

The rain-slicked cliffs that line the camp are a perfect vantage point for scouting. Using zoomable binoculars you can tag enemies, *Far Cry*-style, and a directional microphone lets you listen in on their conversations. It pays to be methodical, as tagged guards will be permanently marked by a HUD icon, even from a great distance.

Inevitably, you're going to be spotted. If a guard catches a glimpse, he'll come searching, and radio his commander. At night they'll shine their torches at any movement. On normal difficulty you can linger in an enemy's line of sight, from a distance, for a good few seconds, but they're much more perceptive on hard.

It's when the enemy gets a long, uninterrupted look at you that they'll enter combat mode, telegraphed by an exclamation point above their heads and a shrieking *brrring* sound that *MGS* fans will know all too well. This will put the entire base on alert. Your best option is to run and hide. You can fight back, but reinforcements will arrive. Generous checkpointing lets you return to an earlier state if you mess up, but this will affect your final score.

MEMORY LANE

Sneak up on an enemy and you can interrogate them. They'll reveal the locations of hidden weapons and tag nearby enemies. Stunned foes will eventually wake up and sound the alarm, so it's best to fire a tranq dart at them before you move on. They'll also mark XOF patches on your map, nine of which are hidden around the camp. They're worth finding, because they unlock two very silly bonus missions—Déjà Vu and Jamais Vu—that have been designed with fans in mind. These were previously console exclusives, but on PC we get both.

Déjà Vu sees you recreating key scenes from the first *Metal Gear Solid*, released for the first PlayStation in 1997. It's a shameless parade of callbacks, and anyone who didn't play *MGS* will find it deeply confusing. If you're a fan, the snow and wolves—which recreate the ambience of Shadow Moses, the setting of the original game—will make you all misty-eyed. Then there's Jamais Vu, which sees you playing as Raiden from *Metal Gear Rising: Revengeance*. Body-snatching aliens have disguised themselves as guards, and you have to identify them with your binoculars and kill them.

These missions are just extras, really. A bit of irreverent fun. The meat is in the main mission and the side ops, which took us eight hours to complete. You might balk at the idea of paying $25 for a single level, but trust us: there's a *lot* of game in here. With just one location, it's deeper and more varied than some games a publisher would happily charge $60 for. –ANDY KELLY

VERDICT
9

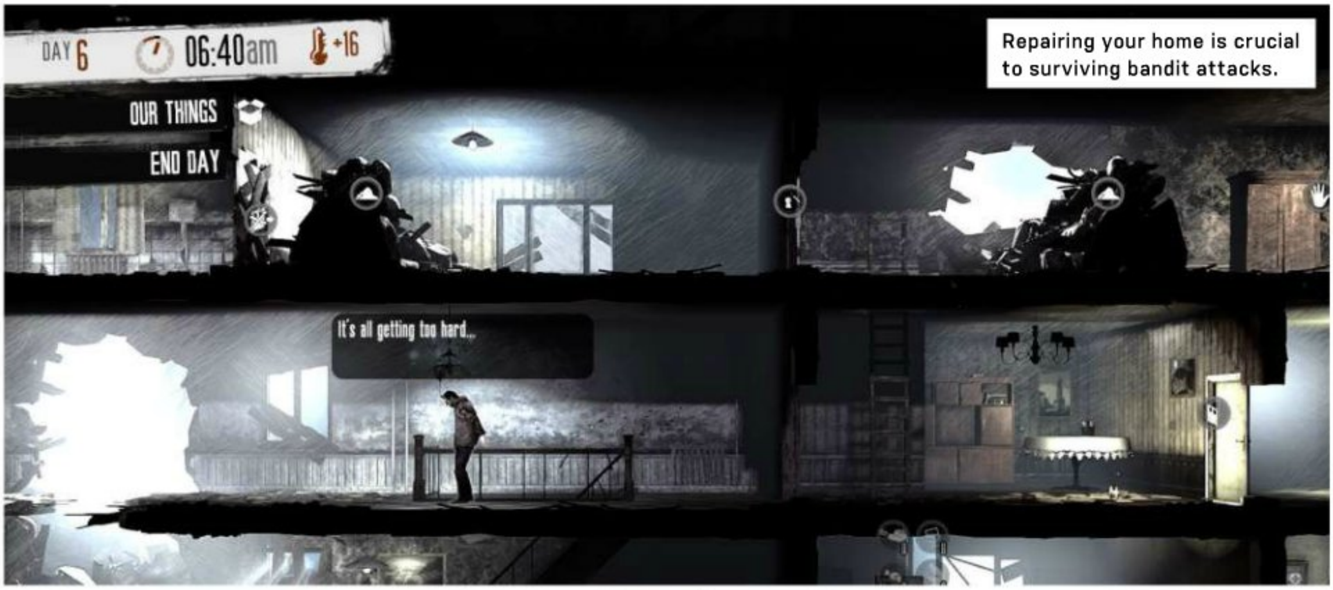
Metal Gear Solid V: Ground Zeroes

+ **SOLID AS A ROCK:** Deep, challenging, and enjoyable stealth sandbox; movement has improved.

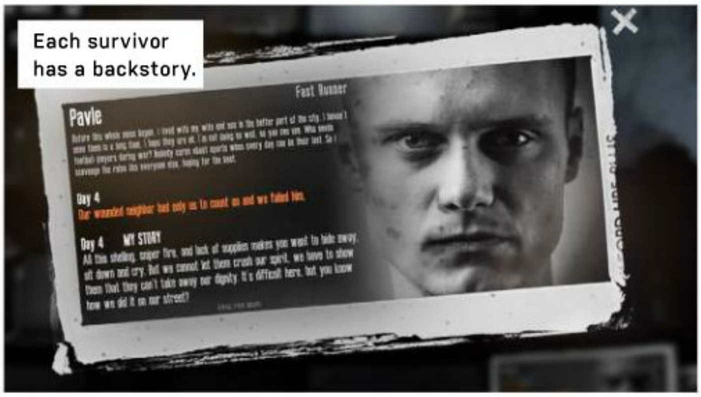
− **SOFT AS PUTTY:** Controls can still be quite tricky; bonus missions a bit silly.

RECOMMENDED SPECS: GeForce GTX 970; Intel i5-3570K @ 3.4GHz; 16GB RAM.

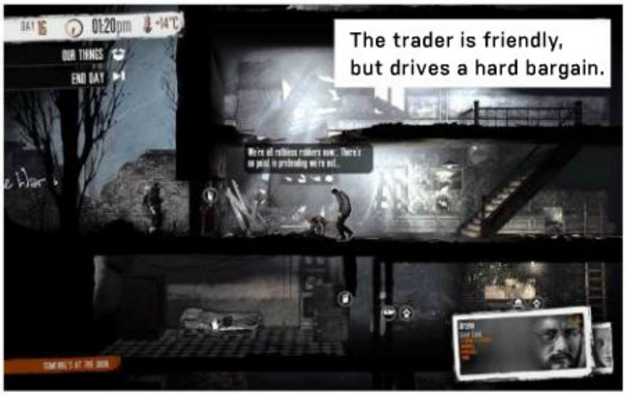
$25, www.metalgearsolid.com, ESRB: M



Repairing your home is crucial to surviving bandit attacks.



Each survivor has a backstory.



The trader is friendly, but drives a hard bargain.

This War of Mine

A delicate statement on the struggles of survival

WE'RE WATCHING, HELPLESSLY, the final moments of a woman who has lost the will to live. Katya returned from studying abroad to a country where people scavenge to stay alive. A few days ago Anton, formerly a teacher, died of starvation. Before him Pavel, once a star footballer, was wounded when roving bandits besieged our base. Without bandages he bled out.

Cveta, mother figure of the group, becomes sick so Katya goes in search of meds. A nearby house has what we need, but it's home to an elderly couple. Brandishing a knife she hobbles to their bathroom as the old man desperately pleads not take his sick wife's medicine. Katya isn't a bad person, she's desperate. But it's too late anyway. Cveta dies. Depressed and starved, Katya crumbles to her knees. We frantically click the tinned food icon hoping she'll eat, but she ignores our commands.

This War of Mine explores the harrowing realities of living amid conflict. Its resource management, life-sim, and exploration game mechanics are simple, but they elegantly drive home their message: in modern war, you will die like a dog.

Each day plays out in two phases. In the light, snipers confine your characters to a musty building. As in a grim version of *The Sims*, you click to assign your people tasks, such as making food, building stuff, clearing rubble, or administering first aid.

Resources are gathered at night when one character scavenges while others stand guard. Locations include abandoned schools, hospitals, and churches. Walking is silent but slow, while running comes with the risk of noise. There's real tension.

HARSH REALITIES

Defenceless NPCs cower, others barter, still others respond with deadly force. Your characters are fragile, weapons are difficult to come by. You never feel safe. Whether pillaging an abandoned house or risking all in a fortified hotel, there's a feeling it could all go wrong in the blink of an eye.

When desperate children plead for food, turning them away impacts your characters' mental state, making them depressed, even suicidal. It's common to find a character has hung themself.

This War of Mine is one the most interesting games of the year, but it's also very difficult to play. Its world always has its boot to your throat, slowly upping the pressure until the life is drained from you. There's no happy ending, but ultimately that's the point. –TAMOOR HUSSAIN

VERDICT
8

This War of Mine

APOCALYPSE NOW: Hugely atmospheric; great stealth mechanics; intelligent.

PEARL HARBOR: The unrelenting cruelty is a bit of a mood killer.

RECOMMENDED SPECS: GTX 650 Ti; Intel Core 2 Quad Q6600 @ 2.4GHz; 8GB DDR2.

$20, http://bit.ly/1ljUgOY, ESRB: RP

Future

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LAB NOTES

TOM MCNAMARA **TECHNICAL EDITOR**

We're Living in the Future

No jetpacks yet, but forward motion

SHORTLY BEFORE THE END OF 2014, I had a briefing with Samsung. I was told about an all-in-one PC with a 27-inch curved screen that also streams music over Bluetooth without being turned on. Samsung also talked about a laptop that could intercept your mobile phone calls and texts. In the lead-up to Christmas, 500GB SSDs were dipping below $200 a pop. When this size first debuted in 2009, it had less than half the performance and cost several times as much. Meanwhile, with the Intel Core i7-5960X, we have an eight-core CPU with 16 threads in home desktop systems.

Everything I've listed here is an incremental step. But when you look from a bird's-eye view, we're doing amazing things. And it's not just the high end. We also have $200 laptops with x86 CPUs, nothing like the sluggish Atom-based netbooks of yore. Some of them even come with Windows. We found a 22-inch 1080p monitor made by LG for $90, brand-new (model 22M35D, if you're wondering). It even has LED backlighting and a DVI port. For $70, you could buy the Pentium G3258, a dual-core CPU that overclocks to around 4.5GHz and performs respectably in most games, alongside a discrete GPU. In that department, $100 would get you a Radeon R7 260X with 2GB of VRAM. The future of PCs isn't just for people with money to burn. It's for anybody with a summer job.

When my father bought a Commodore 64 back in 1982, it cost $595. That's about $1,450 in today's dollars and was considered a price revolution at the time. And you still had to bring your own monitor and storage. Today, that amount will buy you a complete system for gaming, streaming, content creation, and looking at pictures of cats. It's a brave new world, and I can't imagine what it will look like a generation from now.

The C64 would cost $1,450 today and is completely outmatched by a $100 tablet.

JIMMY THANG

Online Managing Editor

I'm a guy who gets stuff done... that is, when I can remember. Problem is, I've always had a lousy memory. Luckily, cloud computing and smartphones have largely mitigated this issue. If I realize I need some TP, I fire up Google Docs to write a list for my next trip.

It's taken my getting-sh*t-done abilities to a whole new level. The downside is that I'm pretty sure if cloud computing were to collapse, I would no longer function. My over-reliance on cloud computing has sadly also brought my forgetfulness to a whole new level. I've become addicted to technology. I know because I wouldn't have remembered to write this if it weren't for my chicken-scratch notes on my online to-do list.

TUAN NGUYEN

Editor-in-Chief

A few days ago I sorted through the *MPC* Lab. We've a lot of stuff! Actually, I'm surprised at how much hardware endlessly flows in. There are plenty of opportunities to take what we have, and what's arriving, and come up with great ideas for the magazine, that aren't reviews. The reviews should go online, so you get the scoop on hardware on day zero. The magazine ought to feature tweaking guides, hacking and modding tutorials, head-to-heads, and other features that give you value but aren't as time-sensitive.

Things are looking good—ideas are churning, new plans being put into place, positive changes are in the works. I'm excited. And I'm excited, as both a subscriber and the EIC.

First Look: Toshiba Portégé Z20t

New two-in-one convertible using Intel's new Core M CPU

Start
nook
TOSHIBA

With the optional keyboard dock, the Z20t gets an extra eight hours of battery life.

INTEL MAY HAVE BACKED OFF A BIT on its Ultrabook initiative, but Toshiba is still pushing hard to make the best laptops it can. Leading its charge is the company's new Portégé Z20t, which also doubles as a tablet. While there are plenty of hybrids out there, many of them make compromises to either the laptop or tablet form factor. The Z20t aims to offer the best of both worlds.

Powered by Windows 8.1, the Z20t uses a 12.5-inch 1080p touchscreen IPS display. The device uses a magnesium casing, which Toshiba says is strong but light enough so that the tablet weighs a very reasonable 1.6 pounds. With the optional keyboard, it looks like a traditional clamshell notebook and weighs 3.3 pounds. One nice feature is that you can detach the tablet, turn it 180 degrees, and re-attach it to use for presentations. The hinge also allows you to fold the tablet down onto the keyboard.

What adds some zing is that it uses Intel's new Core M CPU. This processor is unique in that it's passively cooled. That's right, it doesn't need or use a fan. Plus, it offers better integrated graphics than Haswell. A lot of the other specs can be customized. It can come with either 4GB or 8GB of RAM and can be outfitted with a 128GB, 256GB, or 512GB speedy M.2 SSD.

Ports on the laptop include a microSD card slot, Micro HDMI, and micro-USB. If you needed additional ports, the keyboard dock offers ports for VGA, HDMI, Ethernet, and two USB 3.0 inputs. Another bonus of the keyboard is that Toshiba claims it can add an additional eight hours of battery life to the device. Considering Toshiba says the tablet can already last nine hours, that pretty much means two days of use. The keyboard is also backlit, if you need to work into the wee hours of the morning.

One feature that piqued our interest is that the Z20t comes with a built-in Wacom digitizer and stylus that Toshiba claims offers over 1,000 levels of pressure sensitivity. It should come in handy (no pun intended) when you need to sign electronic documents or feel like exercising your drawing skills. The stylus also has a digital eraser on one end, which is nice.

The tablet will be sold separately starting at $900. The combo unit will start at $1,400. Expect them to ship Q1 of 2015. **–JT**

The Z20t has a Wacom digitizer and comes with a stylus.

Start
nook
TOSHIBA

GEEK TESTED & APPROVED

Lexar M20 JumpDrive

64gigabytes
Lexar
USB 3.0
64gigabytes
Lexar
USB 3.0

Don't jump just yet.

WITH THE PROLIFERATION OF MOBILE DEVICES that use micro-USB ports, we've had to jump through a few hoops to hook up these devices to a standard thumb drive. Companies such as Lexar have stepped in by adding micro-USB connectors. The JumpDrive actually has the smaller connector on one side, and a regular-sized one on the other. The bigger one even has USB 3.0, averaging about 100MB/s transfer speeds. It's not going to break any land speed records, but that's respectable for its size.

There's also a little loop to add a lanyard or put the drive on a keychain. The transparent blue plastic doesn't exactly impart a sense of durability, though. In fact, the slider on the side that allows you to toggle between the two connector types came off in our hand during testing. Thankfully, it snapped back on after some fiddling. But if the teeth on the inside ever break off, it will be quite a hassle to push those connectors around. The USB 3.0 end of the slider also felt stiff going in both directions, at times requiring both hands to operate smoothly.

As this issue went to press, the M20 JumpDrive was the only flash drive on the market that had both micro-USB and USB 3.0 connectivity. But after our experience with this unit, we'd recommend waiting to see what else the market comes up with. You don't want to be stuck with a storage device that you can't get data off of. **–TM**

$30 (street), www.lexar.com

LETTERS

WE TACKLE TOUGH READER QUESTIONS ON...

> Multiple GPUs
> Modern Adventure Games
> CPU Updates

Maxing Out on GPUs

I'm preparing a build and I'd hoped to beat the pants off of my friends by showing them a system with dual 4K monitors. I know you guys said we should run SLI, and I'm fine with that. However, is there a cap to the number of GPUs that can go into a system without using dual-GPU cards. I was planning on using either four 970 GTX or 980 GTX-based cards, but your January "Talking Tech" section made me question if it was possible. Can I use four individual GPU boards? I'm planning on basing the system on the Haswell-E 5390K CPU so as to have sufficient PCIe lanes, but if I can go to the 5820 instead and still make four of those high power GPUs work, I'd like to since I'm mostly a gamer. **—Dan Egli**

TECHNICAL EDITOR TOM MCNAMARA RESPONDS: Hi, Dan. For gaming on a desktop PC, we're limited to four GPUs total, whether in single- or dual-chip format. We built a system with three 780s and reliably sustained over 60fps with all the visual effects cranked up (minus antialiasing). So four 980s will smoke pretty much everything. Both the 5820K and the 5930K have six cores. The difference is the 5820K has 28 PCIe lanes, while the 5930K has 40. We'd recommend six to eight cores when you get into the three to four GPU range, because the CPU needs to pre-render each frame sent to each videocard.

A tri-780 GTX setup from May 2014's "Build It."

GEFORCE GTX
GEFORCE GTX
GEFORCE GTX

Harking Back

Does anybody remember the days of *Police*, *Space*, *King's Quest*? What about *Day of the Tentacle*? *Sam and Max*? Or *Indiana Jones and the Fate of Atlantis*? These classic adventure games combined good story lines with puzzle solving in a way I just don't see anymore. Even though I know it by heart, I will go back from time to time and replay *Day of the Tentacle* just for fun. Why don't we see games like this, brought to today's standards? **—Dudie**

ONLINE MANAGING EDITOR JIMMY THANG RESPONDS: My favorite game of all time is probably *Grim Fandango*, so I definitely feel ya on your love. Having said that, I actually feel like adventure games are undergoing a renaissance. Take a look at some of Telltale Games's new episodic series. *The Walking Dead* and *The Wolf Among Us* are modern takes on the old genre, and they're amazing. Their writing, graphics, and presentation are all top-notch. Sure, these yarns are straying from the overly complicated fetch-quest puzzles, but to be honest, those were my least favorite parts anyhow. But, if those challenging puzzles are your cup of tea, there are plenty of indie adventure games out there, such as *Machinarium*. As for some of those specific titles, have you played Telltale's modern take on *Sam and Max*? It's a good series with a healthy dose of puzzle solving. And did you know Telltale's also working on an HD remake of *Day of the Tentacle*? And don't get me started on the upcoming *Grim Fandango* redux. A wise man (or maybe it was a Pixar character) once said, "Adventure is out there," you just need to know where to look.

Ivy Bridge Upgrade

I have an HP Model DV7T-5000 Laptop with a Sandy Bridge i7-2630QM processor with (I believe) the HM65 chipset. Can I replace this CPU with an Ivy Bridge i7-3610QE? Would this be worthwhile? If not, could you recommend a more appropriate CPU? I have 6GB memory and 750GB HD running Win 7 Pro. **—Ed**

ONLINE MANAGING EDITOR JIMMY THANG RESPONDS: Hey, Ed. We called our friends

↘ submit your questions to: comments@maximumpc.com at Intel and according to them, it's not upgradeable. If you're looking to upgrade the CPU, it may be time to just pony up for a new laptop. If you're bummed out, take comfort in knowing that according to the benchmarks we've seen, the Ivy Bridge part isn't much faster than your current offering.

It might be worthwhile adding a bit more RAM to your system. Swapping your hard drive in favor of an SSD will also help.

> “
> WHY DON'T WE SEE CLASSIC ADVENTURE GAMES LIKE *KING'S QUEST* BROUGHT TO TODAY'S STANDARDS?

Faster Gaming

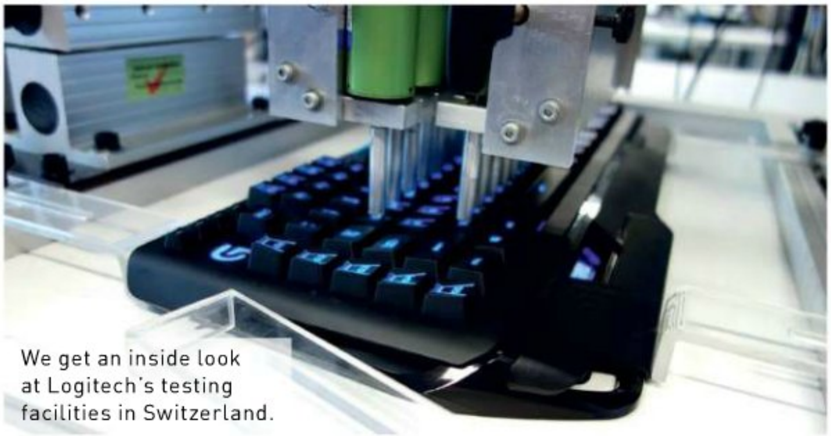
My rig has an AMD 4350 Black, 16GB RAM, Gigabyte 990FXA-UD3 mobo, and a 7970 GPU. It doesn't seem powerful enough to play all games at max settings—*Crysis 3* is under 30fps, although *Far Cry 4* plays fine. I want a new rig that will last four to six years, with GPU upgrades every year or so. I assume I should either get the newest LGA 2011 V3 or wait for Skylake. Besides gaming, I want to be able to use it for video encoding. I really need a faster rig. **—Colin**

TECHNICAL EDITOR TOM MCNAMARA RESPONDS: Colin, I think it's your CPU holding you back. It's labeled as a quad-core chip, but has only two floating-point processors, and FX chips in general don't have great performance per core, compared to Intel's i3 and i5. You can pick up an FX-8350 for $160, and that should give you a solid boost. If you want something longer term (but more expensive), an Intel Z97 board and Core i5 would last a while. Z97 will be compatible with Intel's Broadwell generation of CPUs coming next year. Your videocard is still fine for gaming at 1080p. It's basically the original version of the Radeon R9 280X. If we're talking four to six years, I'd recommend spending at least $150 on your motherboard. ⏻

[NOW ONLINE]

LOGITECH'S BIG SWITCH SWITCH

Once upon a time, Logitech was the premier PC gaming peripheral brand. Over the better part of a decade, however, the company shifted towards console accessories and other endeavors, while companies such as Corsair, Razer, and SteelSeries swooped in to take the thunder from the Swiss firm. But Logitech tells us it now wants to win back the hearts (and hands) of PC gamers. To show us its commitment to the market, the company invited us to its testing facility in Switzerland to show us its new take on the mechanical keyboard. Check out what we thought of it here: http://bit.ly/MPClog



We get an inside look at Logitech's testing facilities in Switzerland.

Facebook Polls

Speeding Up Your PC

We asked our Facebook friends how they boost PC performance when they're feeling a lag. Here's what some of them had to say.

Paul Fulton: SLI it all the way.

Matt Carney: Use msconfig to disable startup programs. Everything else is just snake oil!

Harrison J. Moore: I add more blue LEDs, because everyone knows the more a computer glows, the better it performs!

Jon Neilson: Rip its guts out and rebuild it.

Todd Kay: Deactivate Flash on all browsers and reduce the visual effects under performance settings. That and adding an M.2 for my C-drive has worked great.

Frank Cathey Jr.: Adjust the rabbit ears.

Jim Blaich: I fix computers for a living, I've been in the industry for about 30 years. I learned my lesson a long time ago—I switched to Linux. My computer doesn't slow down.

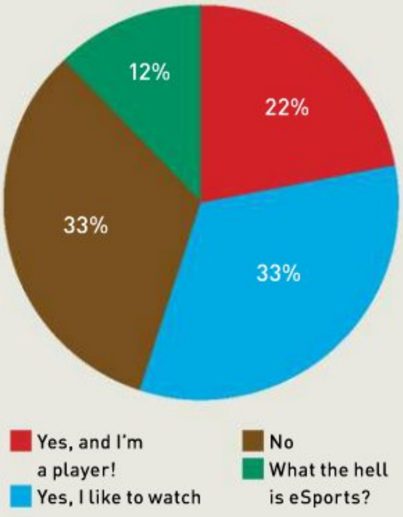
Jamie Paugh: I usually take a thorough look through the installed programs list and uninstall anything I don't use anymore. Then do updates. Then defrag.

Brian Joudrey: Move your OS to an SSD. Applications and games on a traditional drive for mass storage.

Bobby Harmon: Download more RAM, and change the blinker fluid.

Clyde Davidson: I have a Linux machine I built that is plenty fast enough in CPU, memory, and all SSD drives. It started having moments of slowness. It turns out my motherboard was dying. Make sure everything actually works.

Are you into eSports?



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THE BUILDS

BUDGET GAMER

INGREDIENTS

PART		PRICE
Case	NZXT Source 210 Elite	$50
PSU	Corsair CX500M 500W	$45
Mobo	Gigabyte GA-H97M-HD3	$75
CPU	Intel Core i3-4150	$120
GPU	Sapphire Radeon R9 280 100373L	$170
RAM	2x 4GB G.Skill Ripjaws DDR3/1600	$63
SSD	120GB SanDisk Ultra II **NEW**	$70
HDD	Seagate Barracuda 1TB	$60
OS	Windows 8.1 64-bit OEM	$100

Approximate Price: $753

IT'S FAIR TO SAY at this point that AMD has backed off its intention to stop selling the Radeon R9 280. Since it's arguably the best value in the $150-$200 price range, we won't stop recommending it. The Intel 530 SSD from last time has seen a price adjustment, so we've swapped to the SanDisk Ultra II. Lower-capacity units usually have fairly slow write speeds, but this one is an exception. As for the rest of the build, the dual-core Intel Core i3 CPU performs robustly against comparable AMD parts that have a lot more CPU cores, thanks to high efficiency and speed per core. Our H97 mobo chipset ensures compatibility with Intel's new Broadwell generation, and our case, PSU, and hard drive are chosen for their high bang-to-buck ratio.

MIDRANGE

INGREDIENTS

PART		PRICE
Case	Corsair Vengeance C70	$108
PSU	SeaSonic X-850 850W **NEW**	$99
Mobo	MSI Z97 Gaming 5 **NEW**	$147
CPU	Intel Core i5-4690K	$210
Cooler	Cooler Master Nepton 280L	$100
GPU	Sapphire Tri-X Radeon R9 290	$250
RAM	2x 4GB G.Skill Ripjaws DDR3/1600	$63
Optical Drive	Samsung SH-224DB/BEB	$20
SSD	Crucial M550 256GB **NEW**	$94
HDD	Seagate Barracuda 3TB ST3000DM001	$103
OS	Windows 8.1 64-bit OEM	$100

Approximate Price: $1,294

WE'VE UPGRADED from the Crucial MX100 SSD to the M550, which boosts your sequential write speeds by up to 200MB/s, for a total of 500MB/s. We probably could go higher, but we'd see diminishing returns. We also found an 850W SeaSonic X series power supply for $100 after rebates. This is a premium unit, and extremely quiet. We've also switched our mobo from the Gigabyte Z97 G1 Sniper to the MSI Z97 Gaming 5. The latter delivers SATA Express and M.2 slots. If you prefer Sound Blaster audio, we'd recommend the Sniper. The Corsair Vengeance C70 case has nice looks and varied cooling options. Intel's Core i5 remains a workhorse. The Radeon R9 290 is your best value, and the Sapphire Tri-X is one of the best implementations of it.

TURBO

AS THIS ISSUE WENT TO PRESS, Samsung was in the process of transitioning from the 840 EVO to the 850 EVO line of solid-state drives. Since the former may be discontinued by the time you read this, and the latter was not yet priced competitively, we've gone with the Crucial M550 once more, but with twice the capacity of the unit in our midrange build. Again, there are faster SSDs out there, but home desktop users are unlikely to benefit from the differences that would cost them more money. We've also switched the NZXT Phantom 530 case for the Corsair 750D. The latter has more straightforward installation for the Cooler Master Nepton 280L CPU cooler. Speaking of CPUs, the 5820K may cost nearly $400, but its six cores with Hyper-Threading can get you some awesome performance for things like editing HD video or running virtual machines. The Gigabyte GA-X99-UD4 got off to a rough start, but it should be fine as long as you update to the latest BIOS. And don't forget that Haswell-E needs DDR4 RAM, not DDR3.

For more of our component recommendations, visit www.maximumpc.com/best-of-the-best.

INGREDIENTS

PART			PRICE
Case	Corsair Obsidian 750D	NEW	$125
PSU	SeaSonic X-1050 1050W	NEW	$150
Mobo	Gigabyte GA-X99-UD4		$230
CPU	Intel Core i7-5820K		$385
Cooler	Cooler Master Nepton 280L		$100
GPU	2x EVGA GeForce GTX 980 Superclocked ACX 2.0	NEW	$1,100
RAM	4x 4GB Crucial Ballistix Sport DDR4/2400		$234
Optical Drive	LG Blu-ray Burner WH16NS40		$70
SSD	Crucial M550 512GB	NEW	$172
HDD	Seagate Barracuda 3TB ST3000DM001		$103
OS	Windows 8.1 64-bit OEM		$100

Approximate Price: $2,769

UPGRADE OF THE MONTH

THRUST MASTER T16000M

It's not new, but if you're riding the wave of space sim revival (*Star Citizen*, *Elite: Dangerous*, *No Man's Sky*), then a joystick with Hall Effect sensors is a great investment. This tech is very high-precision, without breaking the bank. Hardcore simmers will probably still want a throttle controller, though.

$50 (street), www.thrustmaster.com

MAXIMUM PC (ISSN 1522-4279) is published 13 times a year, monthly plus Holiday issue following December issue, by Future US, Inc., 4000 Shoreline Court, Suite 400, South San Francisco, CA 94080. Phone: (650) 872-1642. Fax: (650) 872-2207. Website: www.futureus.com. Periodicals postage paid in San Bruno, CA and at additional mailing offices. Newsstand distribution is handled by Time Warner Retail. Basic subscription rates: one year (12 issues) US: $19.95; Canada: US$24.95; Foreign: US$34.95. Canadian and foreign orders must be prepaid. Canadian price includes postage and GST (GST #R128220688). PMA #40612608. Subscriptions do not include newsstand specials. POSTMASTER: Send changes of address to Maximum PC, PO Box 5852, Harlan, IA 51593-1352. Standard Mail enclosure in the following editions: None. Ride-Along enclosure in the following editions: None. Returns: IMEX Global Solutions, PO Box 25542, London, ON N6C 6B2, Canada. Future US, Inc. also publishes @Gamer, Crochet Today!, Mac|Life, The Official Xbox Magazine, and PC Gamer.

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